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# The Copper Belt of California—I

## Interesting Copper-bearing Formation on Western Flank of the Sierra Nevada Range. Situation, Topography, Geology and Ore Deposits


BY HERBERT LANG*


The copper belt of California, which is frequently spoken of locally as the "Foothills Copper Belt," is one of the most remarkable and extensive ore-bearing formations in the world. It is questionable if there exists elsewhere an area of equal extent containing ore deposits of a similar character throughout. It extends, almost unbroken, for a distance of 300 miles along the western flank of the Sierra Nevada range, maintaining a distinct parallelism to the axis of the range, and to that of the Great Valley of California, of which the belt region forms the eastern boundary. It is consequently parallel to the Mother Lode, the chief gold-bearing formation of the State, which lies along its eastern boundary, nowhere more than a few miles away. Its linear extent, however, is three times that of the Mother Lode, the recognized length of which is but little more than 100 miles. The most productive and promising part of the belt is the central portion, included within the counties of Nevada, Placer, El Dorado, Amador, Calaveras, Tuolumne, Mariposa, Madera and Fresno, in all of which important copper mines have been and are now being worked. Beyond this, both to the north and to the south, other deposits exist, which are entitled to be considered as belonging to the belt; but their development is small and their number few, and the characteristic formation in their vicinity loses its strength and continuity.

### The Copper-bearing Formation

The copper-bearing formation rises from beneath the sediments of the Great Valley on the west, appearing first at a hight of not more than 400 ft. above sea-level, but reaching higher levels toward the east, until it abuts against the granitic and slaty rocks of the mountainous regions. The highest elevation reached by this formation is perhaps 2000 ft. The area occupied by it amounts to several thousand square miles, all portions of which are, so far as observation goes, equally favorable to the genesis of copper deposits; but they are not scattered throughout the area as evenly as such a judgment might indicate. The mines lie in rows, as it were, manifesting a singular, and at present unaccountable, predisposition to rank themselves for long distances in straight lines. If two parallel straight lines be drawn on a map of the region from King's River to the Yuba, a distance of more than 200 miles, the two lines being six miles apart, they will inclose all the more important mines and prospects. The direction of the lines thus drawn will be 28 deg. west of north, and they will be as nearly parallel to the axis of the Sierra range, with the Mother Lode, and with the shores of the Pacific Ocean and the axis of the Great Valley as is possible in the nature of things. This remarkable parallelism is one of the most striking features of the copper belt, extending, as it does, to the strike or the individual orebodies, and to the curious "markers" that accompany most of them.

### Topography and Climate

The region is one of rolling and disconnected hills of moderate hight and slope, the distinctive features of which are their crowns of projecting rocks, either of the peculiar copper-bearing formation, or else of white quartz—or of both—which lend character and attractiveness to the scenery. Trees are scarce, and the country is poorly watered. Springs seldom break out from the rocks of this formation, but as there is in places a considerable overburden of gravel and dirt, derived from the long continued erosion to which the land has been subjected, a small amount of rain-water is stored naturally from one rainy season to the next, furnishing a precarious supply, sufficient for the few inhabitants and for the animals which are their chief support. In the spring the hills are clothed with rich grasses, and the few trees are objects of beauty; but the greenness and attractiveness depart with the approach of summer, and throughout the dry season drought, dust and heat reign. With the exception of a few favored tracts, of small extent and capabilities, there is no more disagreeable place of residence in California than these lower foothills. The mercury climbs; I myself noted the temperature when it reached 115 deg. in the shade and above, and once when it achieved 122, a record at that place, and so far as I am aware, a record also for the State outside of the Colorado desert, which I know by experience is somewhat warm. But even at the high temperature named, men were able to do a day's work even when exposed to the full rays of the sun; out of a gang of 20 who were engaged on that occasion in riveting up iron work on stagings, only one was in anyway incapacitated by the heat. By ascending the range a short distance we find a much more moderate temperature, and in the Mother Lode region the climate is much improved—in fact it is considered by many to be the best climate in the world. Bayard Taylor, I believe, was the first to call attention to its average excellence. There the days are cooler, the outlook is pleasant, plant growth is more abundant, springs and streams are more frequent, and generally speaking the conditions of life are much better. Being removed but a few miles from a region of such superior excellence, there is no reason to prevent the operator in copper mines, who is not confined to his berth too closely, from enjoying life in full measure. In other respects than those named, the copper belt presents considerable inducements to the mining operator and investor, as may be inferred from what will follow.

### Transportation in the Belt

I must take this occasion, however, to find fault with the roads of the copper belt, which present a principal obstacle to its development. These roads are few and worse than bad; they are execrable. For more than 50 years the traffic of the gold mining region has been carried on over roads which at no time can be called good, and which at certain seasons are impassable. These roads leading down across the copper belt reach the valley by devious ways, without regard to grade or location. They were evidently based upon the trails of wild animals, and whatever has been subsequently done to them has accentuated rather than removed their objectionable features. Some seven branch railways, departing from their parent lines in the valley, penetrate the copper belt, but actually reach few mines of present importance. On the average their shipments require a wagon haul varying from 2 to 20 miles, and averaging 12 miles. The average cost of the haul must be about $2 per ton in summer, and much more in the rainy season, with times when it cannot be done at all. Thus the


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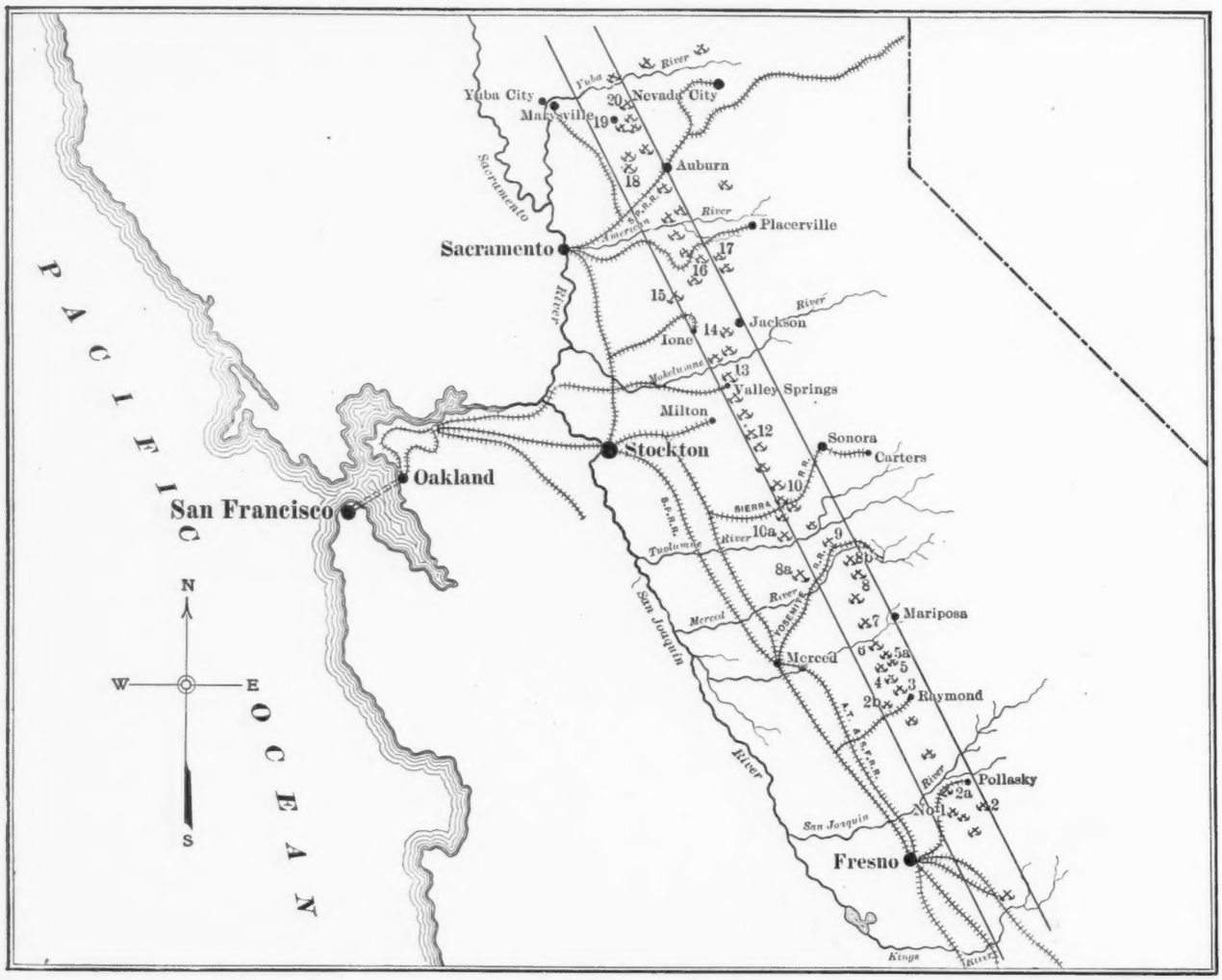
Fresno mine, which lies at a distance of four miles from the railway, pays in summer $1 per ton for its wagon freighting, but in winter finds itself isolated completely at times, when, from lack of fuel it is scarcely able to keep the pumps running to free the mine of water. The Copperopolis mines, which depend upon crude petroleum to fire their smelting furnace, find the 14-mile haul from the railway too great a tax at such times, and are compelled to shut the works down. The Copper King mine in Fresno county, for some time a considerable shipper of ore, was able to carry on business for only a part of the year, owing to the character of the roads, although that company has, unlike the others, expended considerable sums in repairing, and especially in oiling them.




MAP OF CENTRAL CALIFORNIA, SHOWING LOCATION OF PRINCIPAL MINES OF THE COPPER BELT

Legend: No. 1, Fresno; No. 2, Copper King; No. 2a, Painter; No. 2b, Daulton; No. 3, Buchanan; No. 4, Green Mountain; No. 5, Lone Tree; No. 5a, Pocahontas; No. 6, Great Northern; No. 7, Hotaling; No. 8, Victory; No. 8a, Barrett; No. 8b, Woods; No. 9, Salome; No. 10, Oat Hill; No. 10a, Olsen; No. 12, Copperopolis; No. 13, Campo Seco; No. 14, Newton; No. 15, Irish Hill; No. 16, Copper Hill; No. 17, Diamond Springs; No. 18, Valley View; No. 19, Spenceville; No. 20, Mineral Hill.

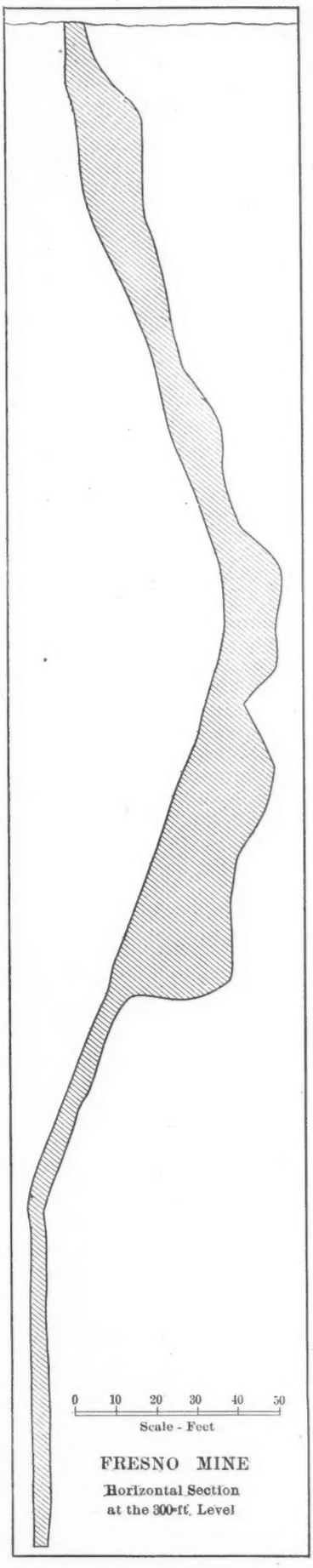
### The Use of Traction Engines

The traction engine has been used with some success in heavy freighting to and from several of the copper belt mines, and I believe that they will prove important factors in the development of the mines when sufficient experience in their use shall have been gained. As a general thing it is found that there is a strong tendency to overload and to expect too much of them. I believe that the makers are to blame for their non-success in many instances, as they have insisted too much upon the supposed ability of the machines to travel over rough ground and to do without a road. The fact appears to be that their requirements in the way of good roads are much greater and more rigid than in the case of mule teams, and nearly equal to those of the steam railway. This is natural, if we consider the construction of the engine, which would suffer from shock in the same degree as other machinery. I believe after examining the performance of traction engines in several localities and under diverse conditions, that, given a hard, broad and even road surface and moderate loads—not exceeding 35 tons for a 15-ton engine—and intelligent handling, freight may be moved for one-third the cost of animal power. But these conditions are hard to acquire and preserve. The engines have a very curious and unexpected effect on soft dirt roads when loaded heavily. The tires of the driving wheels, although made very broad—28 in. generally—get such a grip on the dirt that it is forced backward, and stirred up or at least moved bodily to a depth often of two or more feet. It consequently never packs, but remains loose, and when rain falls upon it it becomes a bed of mud impassable to teams and traction engines alike. When the load in the trailing wagons is lighter there is less backward thrust and the road is less injured. It has been clearly demonstrated that no country road in California can stand the pressure of the huge Daniel Best and Holt Brothers' engines when the wagons are loaded to their maximum capacity; and it is a question in my mind if it would not be policy to reduce their size and weight, and especially that of the wagons which accompany them, since we may be sure that the roads will not in

our time be improved to such a degree that the present heavy machines can be used to their full capacity.

### Geology of the Belt

It is greatly to the advantage of the miners on the belt that the United States Geological Survey has extended its operations over the region, and has produced an admirable and useful series of maps and studies. I do not know what we could do without these aids, in the almost total absence of other reliable helps. The maps of the survey may be found in the possession of prospectors and miners throughout this part of California, among whom a knowledge of geology, especially in its economic bearings, has been cultivated to no mean extent. They are amateurs, of course, but they are men whom it is not well to stir up. The self-conceited tyro who goes among them in the guise of an "expert" is pretty apt to reveal his true character when confronted by the shibboleth "granite or granodiorite." I will not attempt to write a resumé of the geology of the copper belt, for those who may have interest in the subject will find it fully set forth in the folios and other publications of the survey; nor will I recount the mistaken impressions which have in past years gone abroad concerning either the geology or the economic features of the belt. It is my habit to include all the copper-bearing rocks under the general designation "Copper Formation," when speaking of or writing on this subject. Of these there appears to be three classes of rocks, differing in their general character, though not in their relations to the included ore deposits. These are diabase; augite porphyrite (the meta-diabase of Ransome) and amphibolite (massive or schistose) which last is clearly a derivative of the first, or of some related rock. The two former, and even the latter, have been and are now sometimes included under the name of greenstone; but I prefer my own designation, as it has some geographical application, my wish being to describe not only the character of the rocks, but their location, by the term "Copper Formation." These rocks are all of similar chemical composition, and weather into a reddish soil of a clayey nature, and possessing marked fertility when stimulated by water and tillage. The rocks adjoining the Copper Formation are granite—I discard their more precise designation granodiorite as academic—Mariposa slate, and those rocks of the Carboniferous which the Survey groups as the Calaveras division. That the two latter have any genetic relation to the copper deposits I cannot ascertain; but the granite appears to have, so many instances being known where its contact has afforded opportunity for ore deposition. Of some of these I shall speak later.




### Dikes in the Copper Formation

Certain dike rocks along and within the Copper Formation seem to have had a notable effect, the maps showing the propinquity of many dikes to certain important ore deposits. Thus, the Campo Seco mines lie near the contact of quartz porphyry with amphibolite; and close observation would doubtless show many other instances of this sort. I have observed at several localities the occurrence of a grayish-green granular dike rock, which weathers into prismatic forms. The prisms are usually columnar in shape, reaching a length of a foot or more, with a thickness of perhaps one-fourth as much. Sometimes the columns are quite large, and resemble, when seen scattered on the ground, a pile of cordwood. One that I saw was utilized as a fence post! At the Fresno mine two small necks of this rock occur, quite in contact at the surface with the croppings of the great vein. I was unable to observe their situation at depth in the mine, but the conditions at the surface are very suggestive. The necks are nearly circular in form, with a diameter of but a few feet, and penetrate amphibolite of the typical kind, which has been highly decomposed, evidently by their influence. Around them and in the immediate vicinity it has become converted into soft, whitish talc schist, the folia of which curve around the hard dikes in contact aureolae, and gradually become harder and darker as they recede. The dike rock is further peculiar in containing a considerable number of small garnets, which, resisting erosion better than the rock itself, stand out upon the surface, producing a peculiar roughness. There is at the same mine a long and comparatively narrow dike of fresh-looking rock, of extremely coarse grain, which at a glance would seem to be granite. It passes, however, in the course of its trend, into a typical diabase. It is evidently newer than the other rocks of this interesting region, or at least I judge it to be so, and forms the crest of the hill within which the mine is contained. It does not pursue a definite direction, but curves westward at a certain point in its course, and, so far as observation of the surface shows, it has something to do with the orebodies, inasmuch as it is in apparent contact with them for a portion of its length. It is a widely different rock from the porphyritic one previously described, both in substance, and in the mode of its occurrence, forming as it does a dike several hundred feet in length, with a width nowhere greater, apparently, than two or three feet, while the two small necks may be likened to a pair of eyes appearing at the surface.

### The Markers

Perhaps the most curious feature of the whole belt to the casual observer is the "markers," *crestones* or gravestones,

which lend such a singular character to the country. These rocks are usually the projecting edges of certain layers of amphibolite, which have proved more resisting than the remainder of the formation, and when the country around was eroded, they were left standing like monuments placed by the hand of man. They generally weather very dark, and give a most somber character to the scene. They occur sometimes in a single row, sometimes in several, or in many parallel ones. Their dip is the same as that of the formation in general, which in most cases is about 70 deg. northeast, and the rows are sometimes a mile or more in length, lined with mathematical accuracy over hill and dale. Their weathering produces prismatic forms in general, but sometimes, as at the White Knob mine, a shaly structure has been developed, and considerable quantities of comparatively thin plates of the rock may be seen. The markers sometimes project 8 or 10 ft. from the ground, but as a rule not more than four or five feet.

### Variations in the Schist

The amphibolite schist of which I have spoken so often is not by any means of the same appearance throughout. In some localities it becomes porphyritic with stranger minerals. Thus at the Daulton (or Ne Plus Ultra) and at other mines in the southern part of the belt, I have observed the occurrence of what I may call andalusite schist. At the Daulton the rock is charged with short, thick crystals of andalusite, which may average ¾ in. long, by ⅓ in. in thickness. I am not aware of the extent to which this rock is developed here, but at the Great Northern mine, in the adjoining county of Mariposa, it forms the hanging wall of the mine, and constitutes a belt of some miles in length. Here the andalusite crystals are much longer and more slender. In the same vicinity there exists a variety of knotted schist which possesses some mineralogical but no economic interest so far as I know.

### The Quartz Masses

A very noticeable feature of the belt is the quartz masses that crown so many of the eminences. For the most part barren of gold or other element of value, they serve only as landmarks to the traveler. The greatest, and at the same time the purest, body of quartz that I have ever seen above ground, constitutes the well-known White Rock of southern Mariposa county. This stands, like many similar but smaller masses, on the very top of a hill which rises some 1200 ft. above sea-level. It can be seen for 50 miles, and is a celebrated landmark for all that region. It is probably 1000 ft. in circuit, is perhaps 100 ft. high, and is approximately turret shaped. It rests upon amphibolite at the point of contact with granite. Many such masses, although smaller, are found in the belt, some of which have, in a measure, the aspect of out-cropping veins. They are never of great longitudinal extent, and so far as is known or surmised they do not go down far. Most of those that simulate the character of veins more closely, consist of material more friable and less pure than the blow-outs which I have described, and in some cases they are found to be gold-bearing. In the search for acid-fluxing material for the smelters which have treated the ores of the belt, a great many deposits of quartz have been examined, and some have been worked to a small extent, but invariably with poor results. Such veins are exceedingly shallow and unreliable, although they are apt to look very well on the surface. I recollect that in the effort to get flux for smelting works some half dozen such deposits were completely exhausted, while the total yield was less than 1000 tons, the average content of which was some 60c. per ton in gold. These segregated or gash veins have no gouge, nor have they metamorphosed the inclosing rocks to any appreciable extent. Many of them, narrow and wide alike, extend not more than 5 or 10 ft. below the surface—in fact it is sometimes found that their greater bulk lies above ground. They do not seem to possess the same strike as the country in general, but cut across it in almost any direction, as if by chance. One vein, perhaps 3 ft. in width, cuts the main orebody of the Fresno mine nearly at right angles. It is composed of very pure quartz, barren or nearly so of precious metals and of copper. It is a blind vein.

### Gold-bearing Quartz Veins

Gold-bearing quartz veins are not rare within the rocks of the Copper Formation, and some of them have been worked with encouraging results, but as a rule they are less abundant and less permanent than those of the slate formation to the east and west. It is characteristic of those in some localities to have a spotted or pockety habit, which renders them less reliable than the veins of the Mother Lode, while not detracting from their value as a source of paying flux. It is quite likely that a vein which carries its values in restricted portions may be worked in connection with other smelting material quite as profitably as if they were more evenly disseminated. As a rule such paying deposits contain a greater proportion of pyrritous matter than the quartz of the Mother Lode, and this remark applies equally to the gold mines of what is commonly called the East Belt, which lie in granitic rocks, and parallel the Mother Lode on its eastern boundary. These facts, it will be observed, may have an important bearing upon the reduction of the copper ores, which, being generally basic, demand the addition of silicious flux to the smelting mixture.

### Effect of Dikes on the Formation

The fact that the eminences of the belt region are crowned as a rule by these quartz blow-outs and the hard outcroppings of the schists (the *crestones*), gives a clue to the genesis of the hills. The topography was no doubt determined largely by the prior existence of these enduring species, which resisted the action of the elements which eroded the softer neighboring rocks; consequently an elevation occurred in what might originally have been a flat surface, and a slope, or series of slopes, was formed, by which the effect of the rains was accentuated. Valleys and cañons were formed, and the work still proceeds. Travelers have noticed the irregular contour of the country—an irregularity that interposes a serious obstacle to railroad and even to wagon road building.

### The "Markers" and the Orebodies

The connection of the orebodies of the copper belt with the *crestones* which I have described was early noticed; taken in connection with their marked parallelism, it gave rise to the impression, which has considerable present vogue, that a continuous lode existed, which extended through the belt from one end to the other. Such is not the case. The various lodes, numerous as they are—there may be thousands, small and great—have no physical connection with each other. Whether they are on some extensive fracture or fault line, as their regular recurrence and general similarity suggest, I do not know, and in any event I should be reluctant to hazard an opinion on a subject which necessarily has been closely scrutinized by the geologists of the Survey, not to mention other able authorities. We may therefore take it for granted that no such fault line exists, and, for the same reason, we may also assume that the *crestones* of amphibolite do not represent dikes which have penetrated the formation. In some localities, and especially upon hilltops, there are exposures of schists, generally of small extent, but sometimes of an acre or more in area, which, like the *crestones*, remain in a weathered condition, but still sound, although the masses, which have a generally prismatic character, are sundered from each other, and lie scattered upon the ground. Such isolated and projecting masses furnish convenient sources of supply of an excellent building stone suited for rough masonry. Like all the schists, it drills with considerable ease, breaks well but splintery with powder, and when closely examined is seen to be made up largely of hornblende in long slender needles, which give it a fibrous character.

### Copper Deposits of the Belt

The general type of copper deposits in the belt consists of lenses of ore, of which the upper part has usually been oxidized,

the lower part remaining in its original condition of sulphides. These lenses are frequently of great extent, at times 600 ft. or more in length, with a width sometimes of 50 ft. at the widest part. Like all such lenses they thin out gradually at the ends, and probably at the bottom also. The greatest depth to which lenses have as yet been followed is perhaps 600 ft.; in the cases in which that depth has been reached, the orebodies show signs, as I am informed, of giving out. Information of this sort is not willingly divulged, and I present this only as my impression, gathered from conversation, or inferred from published reports. I use the word lens in the signification customary to geologists and miners, disregarding the irregularities of such bodies, which make them look like anything but lenses when exposed to the eye. The annexed sketch which shows a cross-section of the main orebody at the Fresno mine, illustrates an actual condition. This body, at the 300-ft. level, was breasted out to the walls on each side, for some fanciful reason, and the measurements were taken by a surveyor, so that we can depend on the accuracy of the representation. At this level the body has shrunk somewhat from its size at the level 100 ft. above, and gives promise of pinching out at a further depth of some 300 ft., provided that the rate of shrinkage proves uniform. Its total depth, therefore, would not be far from that cited. The length at the 300 level is nearly 400 ft., and assuming that it takes 8 cu.ft. to make a ton of the sulphides in place, it appears that there may be as much as 400,000 tons of ore in the lens. In this estimate I have deducted a suitable amount on account of the oxides which occupy the upper portion.

### Use of the Core Drill

As in all such cases the Fresno orebodies are surrounded by altered schists and dike rocks, which together make up the mass of the hill in which its four (or five) different lenses lie. A considerable mass of apparently sound amphibolite that cropped beside the vein and was quarried out and carted away for masonry, gave place just below the surface to a softer rock, evidently metamorphosed by a mineral spring, now dry, which in times past marked, I presume, the expiring efforts of the lode-building agencies. The lenses here lack somewhat of perfect parallelism, the surveys showing their close approach, but not actual contact, in one or two instances. In some mines, of which the Copper King, in Fresno county, and the Newton, in Amador county, are the examples that come most quickly to my memory, there appears to be only a single lens; while in others there are two, three, or more that are exposed, and always in different planes, I believe. It may well be that in many cases the lenses are blind—that is, do not show on the surface—and hence remain undiscovered. This, and the fact that some of them overlap, make it seem the best policy on the part of miners to do a good deal of cross-cutting, which, so far as it has been done heretofore, has frequently led to good results. The use of the core drill suggests itself for this work, especially as the dip of the orebodies, which as a rule is 70 deg. to the northeast, and the location of the lenses generally in hills, and, finally, the character of the country rock, which is easily and successfully penetrated by the diamond drill, all combine to favor this method of prospecting. Forty feet in a day of 24 hours was made in amphibolite at one locality, the cores being satisfactorily preserved. I have frequently advocated this method in connection with the belt mines, and I am glad to learn that it is to be followed in the exploration of the Green Mountain mine, in Mariposa county, one of the most extensive deposits in the whole belt; and that it is likely that others will adopt it.

### The Formation in the Southern Part of the Belt

In the central-southern part of the belt, near the Merced river, the country rock changes from rocks of a diabasic character or origin, to augite-porphyrite and its derivatives. This formation, which is styled meta-andesite by Ransome, differs in many respects from the others, for examples in not weathering into the *crestones,* and in its hardness in which it exceeds the diabasic rocks. Much of it is tufaceous in character, the exposures showing large embedded boulders, generally of a rounded form, enveloped in the mass. At the Victory mine, in Hunter Valley, Mariposa county, the hanging wall appears to be of tuff, while the footwall reveals a different character. The decomposition of this rock produces schist similar to that resulting from the diabase, while the soil arising from its decomposition is of the same reddish color and fertile character.

### Contact Veins

Of those deposits which can be classed as contact veins or lodes, the Pocahontas possesses as much interest as any. One wall is of granite, the other of schist; but there are evidences that toward the northwestern extension the vein passes quite into the schist and away from the contact. The dip is steeper than is common along the belt, the vein being nearly vertical on the whole. The walls are sheeted in the vicinity of the ore, and show a variety of decomposition products of the granite and of the schist. At the depth of 100 ft. the workings have penetrated a concavity in the granite wall, into which a corresponding boss of schist has entered, and the folia of the latter are shown prettily curved in conformity. Ore deposition has taken place among them, and the width of the lode, nearly all of which can be classed as ore, is not less than 25 ft. at that point. The average thickness of ore throughout the workings may be 4 ft. The shoot dips southeast, and at the lowest accessible point it measures 5 ft. or more, and is of very good quality, assaying probably over 6 per cent. copper. Besides this, the main one, at least one more shoot has been developed; it is in the prolongation of the first, and perhaps 300 ft. farther along the contact. In this body only oxidized material has as yet been reached, but it is of good grade.

*(To be continued)*

## Wire Insulated by Enamel

The many disadvantages of cotton and silk as insulating material for wire, and particularly for wire which is to be used on magnet windings have long been recognized. Many substitutes for these coverings have been brought forward and have failed for one reason or another. The Western Electric Company, of Chicago, has recently put on the market a black enameled wire which it has been using for some few years on its own magnets and which appears to be quite successful when substituted for silk or cotton wrapped wire.

The requisite features in any insulating covering are continuity, toughness, elasticity and high dielectric strength. Moreover the insulation should be inert to such influences as changes in temperature, excessive humidity in the atmosphere and corrosive gases with which it might naturally be brought into contact. The following claims show what performance may be expected from wire insulated by this enameling process: The enamel is expected to withstand a temperature of 500 deg. F. for a considerable time without injuring its insulating properties. This degree of heat reduces the elasticity of the enamel but its insulating properties are not affected if the windings are not disturbed. The enamel is not water proof when actually submerged but it has a very considerable resistance to atmospheric humidity. Enameled wire kept for 72 hours in an atmosphere of 90 per cent. humidity at ordinary temperature underwent no change in its insulation and was able at the same temperature to withstand 99 per cent. humidity for 24 hours. Chemicals and gases which will not act on the wire itself have no action on the enamel.

The ratio of insulating power of the enamel to silk is as 1:4 and hence when enamel is applied to a wire the coating need only be a fourth as thick in comparison with silk to attain an equal degree of insulation. This saving in space, together with its resistance to conditions of moisture are of the chief features of this form of insulation.

# Gas Power as a Factor in Mine Economics

## With Comparatively Slight Modifications Gas Engines Could Be Used Profitably in Mining for All Power Purposes Except Tramming

BY ARCHIBALD BURNETT*

For several years I have closely followed the progress of gas power, and I am fully convinced of its adaptability to mining purposes provided that the precaution be taken of designing apparatus suited to the nature of the work and the rough treatment to which mining machinery is subjected. For many surface operations the standard gas engine will fill all requirements, but for the larger part the apparatus must be of quite as special a character as a mine pump or a mine locomotive. The object of this paper is to show that by suitably constructed apparatus all mining operations involving power can be economically carried on either directly or through some secondary medium, by means of gas power as a prime mover.

For the purpose of this discussion power for mining may be classified under several heads, the most important of which are: Stationary service, including air compressors, sampling works, mills, and various surface machinery of ordinary character; traction, underground and surface aërial trams, conveyers, etc.; pumping, station and heavy-duty surface pumps and emergency fire pumps; sinking pumps and small isolated units, viz., ventilating fans and the like; hoisting, comprising heavy-duty hoists and auxilliary hoists.

### Stationary Service

Under this head comes all ordinary machinery driven at an approximately constant speed. This can be started in the usual way either by hand or by compressed air, under no load, and requires no features absent from the ordinary gas engine. This plan could also be adopted for driving air compressors through belt or rope gearing. Decided economy would result, particularly in the larger units, by direct connection, but this involves no special problems, replacing the steam cylinders of the ordinary steam-type compressor by cylinders for gas being solely a question of machine design.

### Traction Service

This is a class of service not easily handled by a direct use of gas. Experiments have successfully demonstrated the possibility of gas power for railroads, but for underground traction the disposal of the spent gases is a matter of such difficulty that only in rare instances could it be used for such work. There can be no doubt, however, that gasolene motors could become of great service in many of the mines where tramming is now carried on, if proper means of ventilation were adopted. This applies only, of course, to mines especially favored in regard to ventilation.

As a whole, electric power offers so many advantages for traction service that it is difficult to find any form of power more suitable. Gas-driven generators are, however, an unqualified success, and their installation in connection with a gas plant would be an economical and reliable source of electricity for traction work, haulage, aërial tramways and conveyers, besides many minor uses which would be suggested were a source of direct current available. Such an arrangement is analogous to an air compressor for drilling machines.

### Station and Heavy-duty Surface Pumps

Mine pumping is essentially a subject involving large stationary units and small portable units, and for this reason pumping has here been divided into two classes: fixed station pumps and portable sinkers.

The former are readily adapted to gas drive whether of the centrifugal or reciprocating type. The direct-connected electric motor-driven turbine pump is without doubt an ideal unit in point of simplicity, but the first cost of generating capacity makes high-duty pumps of this class expensive to operate. The gas-engine driven pump, although requiring more attendance, has one feature which makes it particularly valuable for station work, and this is the heat rejected in the spent gases. In ordinary practice, this heat, which amounts to 40 or 50 per cent. of the total heat value of the gas, is as a rule wasted, though sometimes it is used for heating purposes. Now in mining it has been shown that great economy can be effected by preheating the air for the machine drills. This, however, is seldom done, because, for one reason, the added attendance is a source of expense. Not only this, but the varying demand for air often overloads the preheaters, resulting in little economy, while underloading heats the air unduly. On the whole, a preheater under ordinary conditions shows an economy more apparent than real.

The use of the spent hot gases from an underground gas-driven pump, in a suitably arranged preheater, alters these conditions completely. The attendance cost is entirely eliminated; no extra fuel is required. Overloading of course lowers the economy but underloading does not overheat the air, because the temperature of the gases is comparatively low.

Placing a preheater at the bottom of a shaft is hardly conductive to economy, for the drop in temperature by the time the air has reached the drills is such as to greatly minimize the increased economy; but even if the air reaches the drills at 200 deg. F. say, after having been preheated to 400 or 500 deg., the gain will be considerable, because the fuel cost is absolutely nothing, the only cost of the increased economy being interest, maintenance and depreciation of the preheater. The preheater also effects an economy in power required for compression and permits the use of a smaller compressing unit because of the increased volume of air after preheating. If the temperature of the descending air and that at the drills be respectively 75 and 200 deg. F., only 82 per cent. compressing capacity is needed as compared with air at 75 deg. F. at the drills. It need hardly be mentioned that this decrease of first cost in compressing machinery will be more than ample to cover the cost of the preheater.

### Removal of Burnt Gases

The disposal of the gases after passing through the preheater presents no serious difficulty. The gas can be discharged directly into the pipe compartment, or into a thin galvanized-iron pipe and exhausted to the surface. Should the temperature be too high it can be readily lowered by spraying with water from the column, the vaporized water preventing the shaft timbers from becoming excessively dry. The powerful draft induced by this upcast would make excellent ventilation as well.

Gas for the engine would be piped in the usual way in light iron pipes, the air required for its combustion being taken from the bottom of the shaft, though added ventilation could be secured by running thin iron pipes to those parts of the stopes and workings where powder smoke is liable to collect, and by taking air from these places the engine on the suction stroke becomes an excellent ventilating as well as pumping unit.

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In fact the ventilation thus obtained would be superior to many of the elaborate systems which simply move vitiated air from one place to another, diluting the bad, and polluting the good air.

I have heard it stated that the largely increased volume of the burned gases would necessitate very large exhaust pipes to the surface to reduce the back pressure on the exhaust stroke. As a matter of fact this argument bears no weight, the increased velocity allowable in the upcast due to the draft being such as to make an exhaust pipe of not more than 2½ times or thereabouts the area of the supply gas pipe, large enough, provided the temperature of the exhaust gases be reduced to 300 deg. F. or thereabouts by cooling with a water spray.

### Fire Pumps and Sinkers

The advantage of a fire pump capable of being started and actually pumping in less than a minute from the receipt of an alarm needs no comment. Suffice it to say that gas-driven fire pumps have been repeatedly started in emergency and have had full pressure on the hydrants in less than 45 seconds. In this respect gas is far superior to steam, there being no time lost in draining steam pipes, or waiting till cylinders become heated. Again, the extremely low stand-by losses of a producer, and the quickness with which it may be blown into commission are such as warrant its being kept ready for emergencies, whereas the contrary being the case with steam, in too many cases, valuable time is lost before an efficient water pressure can be obtained.

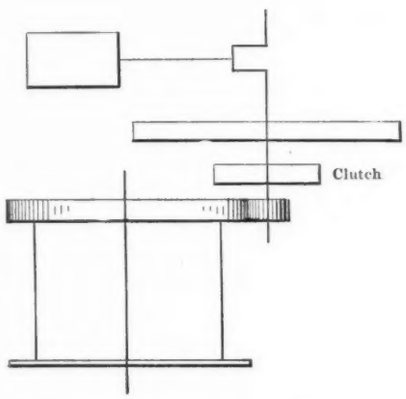


FIG. 1. ARRANGEMENT OF SINGLE-CYLINDER GAS HOIST

As with traction work, gas power is not readily adaptable to portable sinkers. But for that matter the comparatively small size of these units warrants the addition of motor or air drive, at a small extra first cost. In fact the overload margin of the electric generating units would be ample to handle shaft sinkers even when these are run continuously.

### Heavy-duty and Auxiliary Hoists

Unless gas power can be applied to hoisting it can never become of extensive use in mining, for the installation of a steam plant for hoisting and gas for other work would be most undesirable. The advent of a first-motion gas-power hoist will, therefore, mark the beginning of a new era in mining prime movers.

As hoisting is of so varied a character it can be divided into three distinct classes: heavy duty for continuous output involving heavy loads and high speeds, necessitating first-motion hoists; medium speeds which allow of gearing, and finally small units of 25 h.p. or less for sinking and various other purposes where the loads are light.

Considering the last of these divisions first, Fig. 1 shows diagrammatically a gasolene engine connected to a single drum, unidirectional hoist, necessitating a clutch because it is not self starting. Gas may replace gasolene as fuel if the engine is designed for this change, but the difficulties of disposing of the waste gases underground, combined with the necessity of a clutch, are such that the economy to be gained by gas driving would hardly offset the inconvenience, particularly when the intermittent character of the work is considered. Air or electric drive would be superior to gas for use underground, but for isolated prospecting in districts where water or fuel is scarce, the above arrangement would answer admirably.

### Modes of Applying Gas Drive

In hoists of 75 to 150 h.p. gas drive may be applied as suggested in Figs. 2 and 3. In Fig. 2 $A$ and $B$ are two live sheaves, $A_1$ and $B_1$ their respective idlers, and $C$ an idler to make small adjustments in the length of hoisting ropes. $D$ and $D_1$ are clutches respectively engaging the sheaves $A$ and $B$ when the shaft $E$ is at rest. A clutch $F$ picks up the load from the live engine shaft (which runs continuously in one direction) and transmits it through the pinion $P$ to the spur gear $S$ driving the sheave shaft. A fly-wheel on the engine shaft steadies the engine speed and helps start the cage.

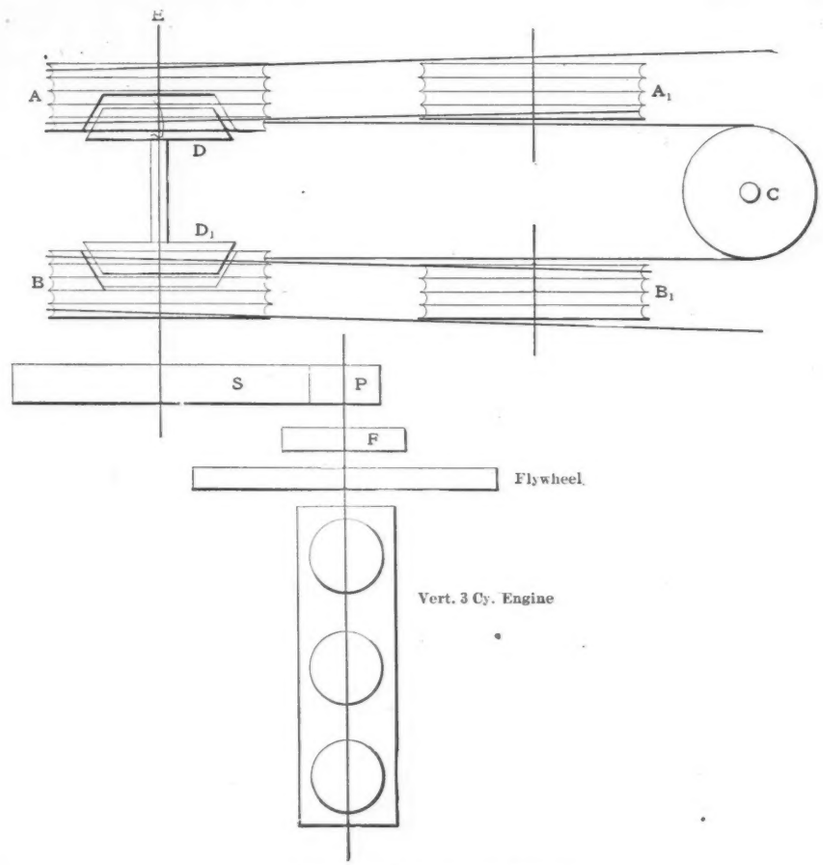


FIG. 2. THREE-CYLINDER HOIST

Another method somewhat similar is shown in Fig. 3. Here the drum $A$ or $B$ is engaged with the drum shaft through clutches $D$ and $D_1$ while the load is at rest. The clutch $F$, pinion $P$ and gears $S$ transmit the power to the drum shaft as in Fig. 2. The drums $A$ and $B$ are not integral with the internal and external gears $I$ and $E$ but are engaged through the clutches $M$. The gears $E$ and $I$ are in turn connected by two pinions on the shaft $K$.

Now if either $D$ or $D_1$ be engaged and the clutch $F$ be closed, one cage will be hoisted while the other will drop, its ener-

gy being transmitted to the ascending cage by the rope in Fig. 2 and by the pinion on *K* in Fig. 3. Although there are three clutches in Fig. 2 and five in Fig. 3 only one of these is subject to a live shaft, the clutches *D* and $D_1$ being thrown in only when *S* is at rest, to reverse the direction in hoisting, while in Fig. 3 *E* and *F* are only used for altering the relative positions of cages for hoisting from different levels. Inasmuch as the clutches *D*, $D_1$ and *M* in Figs. 2 and 3 are thrown in while at rest, they are virtually couplings, but the clutch *F* has to pick up the load from a live shaft.

The old time arrangement of toggles with pivoted arms and sliding collar would probably last a half day on continuous service of this kind. Magnetic clutches, however, or more properly speaking magnetic accelerators, can be obtained which satisfactorily answer the purpose. They have very little wear, are thrown in or out by a small electric switch, and pick up the load gradually. They are made in sizes up to 140 h.p. at 100 r.p.m., so that with an engine running at 200 r.p.m. such a clutch should be ample to carry the load of a 200-h.p engine hoist during the acceleration period.

### Requirements of Heavy-duty Hoists

The essential requirements of a heavy-duty high-speed first-motion hoist are three: reversibility, high starting torque and mobility. Two other points of prime importance in reducing operating costs, though not absolutely imperative, are reliability and economy.

Reversibility in the gas engine is secured in a manner somewhat similar to that employed in the steam engine, by altering the relative positions of the engine shaft and valve vents with respect to time. This does not involve any radical change from standard practice, but rather an application of kinematics. It may be argued that no gas engines have been built reversible, but this is on account of the fact that heretofore no industries have required a reversible gas engine. This also applies to the self-starting feature. Had there been a demand for a gas engine with provisions for self-starting under load, it is highly probable that designers would, by now, have evolved a machine of this type.

With regard to the last statement, I have definite knowledge of some recent work along these lines. The cycle involved has been developed, and all that remains to be done is perfecting the controlling devices and simplifying the mechanism. For various reasons details cannot be dwelt upon, but this much may be said: the cycle is simple, and shows no defects, although experiments may necessitate its modification. Absolute control is secured by two levers besides the usual brake levers, entailing no more attention on the operator's part than the usual lever and throttle of a steam hoist. Finally, extreme mobility is secured as a direct result of the cycle.

The improvements which must undoubtedly follow the exploitation of a machine of this character, will do much toward making it the equal of steam as regards the three features, reversibility, self-starting and mobility.

### Care and Economy

As to reliability and economy, the latter of these is, as far as heat engines are concerned, developed to the highest degree in the internal-combustion motor. The reasons for its superiority in this respect are mainly two: first, the heat of the fuel is

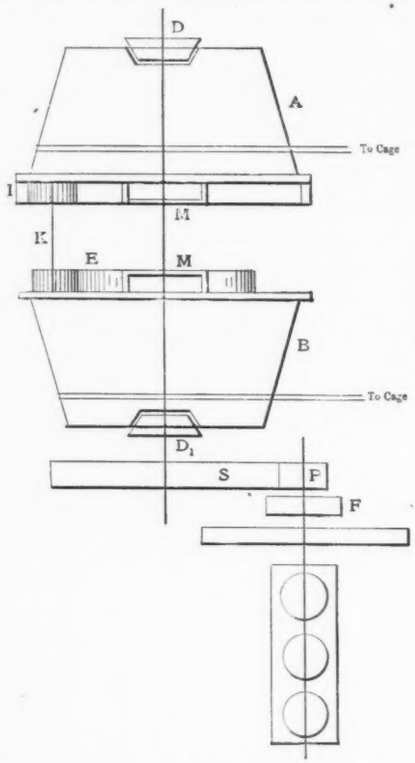


FIG. 3. ARRANGEMENT OF CLUTCHES ON DOUBLE-DRUM HOIST

used directly in the cylinder, not transferred to a medium such as water; second, the heat rendered latent in any vapor cycle is absolutely unrecoverable as work; in a gas engine no heat is rendered latent.

In point of reliability the gas engine will prove itself the equal of steam if the operator understands the philosophy of the engine. This does not mean a thorough grounding in physics or thermodynamics, but a knowledge of gas apparatus as complete as that of a steam operator on the details of steam equipment. It is not surprising that gas engines have been considered unreliable. The earlier engines were undoubtedly so, but, to place a modern gas engine in charge of an operator whose training has been altogether limited to steam and expect uninterrupted service is manifestly unfair both to the operator and to the equipment.

The gas engine, statements of some builders to the contrary notwithstanding, does require care, and intelligent care. Given this and operating conditions as fair to the one as to the other, the gas plant is every whit as exempt from stoppage as the steam plant.

An argument, amounting to almost absolute proof of this, lies in the fact that many German iron works have substituted gas-driven blast-furnace blowing engines for steam driven units. They have, moreover, provided no steam reserve, and the absolute necessity of freedom from shutdown in the blowing equipment of a blast furnace need only be mentioned. In connection with this statement which appeared in a technical journal of recent date was another in effect that no attempts had been made to thoroughly cleanse the gas from the blast furnace before using it in the engine, beyond a crude precipitation of the larger dust particles. At the end of five weeks' continuous running, the engine, on examination, was found to be in excellent condition, although cleaning was necessary. Twelve pounds, or thereabouts, of carbonized material and dust were scraped from the valves. Now if a gas engine can operate continuously under such adverse conditions, conditions fatal to a steam engine, it can, with clean gas, surely demand recognition as being at least as reliable as steam.

### Points of Strength

In comparing gas with steam, the reliability of the plant depends on the strength of the weakest part. With steam it is a question which is the weakest part of the system. Pipes under pressure subject to vibration, low water in the boiler, scale-forming and corrosive waters all have strong claims to this distinction. On the contrary, gas power has no pipes under pressure with the exception of a few feet connecting the blower of the producer with a steam generator of small capacity; the low-water bugbear is absent, and scale-forming waters are not deleterious either to the engine or to the producer.

Concerning safety, it may be briefly stated: given the same class of labor in the producer plant and the steam plant, the former is by far the safer of the two, or in other words, for equal safety, less intelligent labor is required for producers than for boilers.

The distribution of gas is simple. The pipes are necessarily of large area, but the pressures being measured in ounces, the walls can be made of light material, reducing materially the cost of installation and maintenance. A burst pipe may be repaired by simply soldering on a patch.

Finally comes the most vital claim made for the gas engine, economy. All engin-

eers, of course, recognize the high thermal efficiency of the gas engine, but it is doubtful if this recognition is in conformity with the results obtained. The phrase: "One horse-power for one hour on one pound of coal," has been long considered as the ultimate possibility of steam-power production under the most favorable conditions. Its achievement has been approached only in the very best steam practice, under the most favorable conditions, whereas not only has it been reached, but it has been surpassed in ordinary gas-engine practice.

An average of 16 tests of several representative types of engine ranging from 85 to 550 h.p. on full load, gave a consumption of 10,341 B.t.u. per horse-power hour. Considering a fairly good coal of 13,000 B.t.u. per lb., a producer of 80 per cent. efficiency would give 10,400 B.t.u.'s available at the engine shaft for each pound of coal gasified, which is somewhat less than 1 lb. per horse-power hour. Eighty per cent. is, however, by no means the ultimate efficiency of the producer. Wyer ("Producer Gas and Gas Producers," page 99. sec. 172) states that the efficiency of the producer for power purposes can be made to surpass 90 per cent. by returning to the producer some of the heat rejected in the exhaust gases. This of course is not a true efficiency, but it is an actual economy.

TABLE 1 COMPARATIVE COST OF POWER PRODUCTION.

| Assumptions. | |
|---|---|
| Daily output, tons | 4000 |
| Coal per ton | $5.00 |
| Electricity H. P. Yr. | $48.00 |
| Days per yr. | 360 |
| Depreciation. | |
| Steam | 8⅓% |
| Electricity | 6⅔% |
| Gas | 8⅓% |
| Interest & Mis. | 7% |
| Fixed Charges. | |
| Steam | 15⅓% |
| Electricity | 13⅔% |
| Gas | 15⅓% |

DISTRIBUTION.

| Service. | H.P. Required. | Load Factor. | Coal per B.H.P. Hr. Steam. | Coal per B.H.P. Hr. Gas. | Coal Yearly, Tons Steam. | Coal Yearly, Tons Gas. |
|---|---|---|---|---|---|---|
| Hoisting | 500 | 40% | 6½ | 1¼ | 5,600 | 1750 |
| Traction | 100 | 33⅓% | 6 | 1¼ | 870 | 180 |
| Compression | 720 | 75% | 6 | 1 | 14,000 | 2335 |
| Crushing | 200 | 60% | 7 | 1¼ | 3,630 | 670 |
| Pumping | 350 | 60% | 8 | 1⅓ | 7,250 | 1200 |
| Total | | | | | 31,350 | 6135 |

OPERATING COST.

| | Steam. | | Electricity. | | Gas. | |
|---|---|---|---|---|---|---|
| Equipment cost | $175,000 | | $ 72,000 | | $200,000 | |
| Fixed charges | 15⅓% | $ 26,833 | 13⅔% | $ 9,840 | 15⅓% | $36,666 |
| Coal | | 156,750 | | ..... | | 33,710 |
| Electricity, 1870 H.P. | | ..... | | 90,240 | | ..... |
| Attendance | | 18,000 | | 13,000 | | 20,000 |
| Total power cost | | $201,583 | | $113,080 | | $90,376 |
| Cost per ton | | 14 cents. | | 7.8 cents. | | 6.3 cents. |

### Comparison of Cost and Economy

Take a hypothetical mine, with an output of 4000 tons daily, the final cost of extraction being reckoned in cents per ton. The conditions indicated in Table 1 have been brought to a parity in the case of steam, electricity and gas, and although the figures, which have been taken altogether from memory, may show some wide discrepancies, no attempt has been made to juggle them around in favor of one or the other.

In computing the first cost of equipment, only the cost of the prime mover has been considered, including boilers, producers, engines, motors, rotary converters, electric locomotives, etc., but not the air end of compressors or the pumps. The saving in compressor capacity by the use of a preheater has not been credited to the gas plant. In both steam and gas the generators for lighting and traction have been included in the first cost.

Table 1 shows the distribution of power and the quantity required. Column 3 refers to the proportions of time the equipment is actually running at full load, for example, hoisting, 500 h.p. The load factor 40 per cent. gives $500 \times 24 \times 0.4 = 4800$ horse-power hours daily duty, or in other words is considered as working to maximum capacity for $24 \times 0.4 = 9.6$ or 10 hrs. daily. A total of 1800 h.p. in boilers has been assumed as the necessary steaming capacity and the same quantity in producers. In computing capital and fixed charges the cost of gas equipment is taken at 15 per cent. in excess of that for steam, the depreciation being considered equal in the case of steam and gas but less for electric power on account of the longer life of the equipment.

From the table the cost of extraction for power alone comes to 14c. per ton with steam; electricity at $48 per h.p. year almost cuts this in half, reducing it to 7.8c.; while with gas the cost is further reduced to 6.3c., or less than half the cost of steam. It is an interesting fact in this regard to note that the majority of gas-engine builders guarantee a coal consumption of less than half of that of the ordinary steam plant.

In presenting this article my object is solely that of showing the economy of gas power and the possibility of adapting it to mining, although before it can compete with steam many problems will require solution. These, however, are not serious, and the progressiveness of the mining fraternity is such that once the subject is taken up in earnest, means will soon be devised to meet the new conditions, while in the meantime the gas engine as it is at present can undoubtedly be made an important factor in the cheapening of mining costs.

## Ammonia from Peat

Consul Albert Halstead, of Birmingham, describes the Woltereck process, for the production of ammonia by passing a mixture of air and water vapor over peat kept at a low heat in specially devised furnaces. A great difficulty in the commercial utilization of peat has always been the large amount of water it contains. The Woltereck process has overcome this. On a manufacturing scale a minimum yield of 5 per cent. of sulphate of ammonia is obtained from the peat calculated as theoretically dry.

The peat is automatically fed into hoppers and quickly dropped into the furnaces. Here it is subjected to combustion with a blast of air charged with water vapor at a regulated temperature. The resulting gases contain paraffin tars, acetic acid and ammonia. The paraffin tars are removed by the Woltereck scrubber, which retains all tarry matter. The acetic acid is next absorbed in the alkali tower, where the gases meet a hot solution of soda or milk of lime and combine with it to form acetate of soda or of lime. The gases pass from the alkali tower to the acid towers, where they meet a stream of hot sulphuric acid, which combines with the ammonia to form sulphate of ammonia.

## Lead Mining in the Transvaal

Lead deposits in the Transvaal are few and the Edendale lead mines are at present the only ones of this sort in active operation. According to *L'Echo des Mines* (Oct. 14, 1907), the company owning this property, which is situated about 17 miles north of Pretoria, with a rather defective plant, produced 13,342 tons of galena during 1906. Under new management and equipment the mines have an output of about 100 tons per day. It is proposed to erect a smelter which will be the first lead smelting works in the Transvaal.

The lead deposits have been traced for a distance of 6000 ft. and are exploited by two shafts, one of which cuts the vein at 612 ft. and the other at 128 ft. The width of the vein is variable, reaching at places 7 or 8 ft., while a little farther on the width may be only a few inches. The average value of the ore is said to be 28s. per ton and cost of mining 12s. 9d.

# Gilsonite and Coal in Uinta County, Utah

SPECIAL CORRESPONDENCE

Uinta county, Utah, is the source of the entire output of gilsonite in the United States and, situated as it is, comprises a portion of the great Yampa coalfield. Gilsonite exists in vertical fissures in the sandstones and shales of the Eocene-Tertiary period. These fissures vary in width from 2 to 17 ft. from wall to wall. Until about three years ago, this product was mined in the vicinity of Fort Duchesne, Utah, and conveyed by Indian and Mormon wagon-freighters to Price, on the Rio Grande Western railroad, at a cost of $11 per ton; that mined at Dragon, to the southeast of Fort Duchesne, was teamed to Rifle, on the same railway. The price for gilsonite in St. Louis was then about $50 per ton, and the cost, delivered there, was about $20 per ton. Several companies were doing a profitable business. Now, however, according to recent advices, all this is changed. What is known as the Barber Asphalt trust, which has obtained possession of most of the best veins, built a branch railroad, called the Uintah, from Mack, a station on the Rio Grande Western, named after the head of the Barber company, to Dragon, where is one of the chief producing veins. High rates on this, the sole outlet for the products, and a reduction of the price of gilsonite to $30 per ton have practically destroyed competition.

## PRESENT AND FUTURE TRANSPORTATION

The old wagon road to Price, the former outlet, was supposed to be kept in order by the county, but if this was not done, the United States Government, whose supplies for the troops at Fort Duchesne were hauled over the road, stepped in and made the repairs. Now, however, the Government contracts for these supplies over the Uintah railroad, and in consequence the Price road has fallen into such a condition as to be almost impassable for freighters. This has made the trust railroad practically the only means of transportation.

Relief, however, is in sight. Jesse Knight, a capitalist of Provo, Utah, and Reed Smoot, who is associated with him in many profitable enterprises, have met the president and officials of the Denver, Northwestern & Pacific railway, and at that conference it was decided by the Utah financiers to build a railway from Provo over the Wahsatch range, and thence *via* the Strawberry and Duchesne river valleys to Jensen, a point on the surveyed line of the "Moffat road" on Green river, at the State line between Utah and Colorado. Engineers are now making the preliminary survey, and this line, which will pass through the center of the hydrocarbon fields, is practically assured.

The freight charge from Dragon to New York is, at present, $23.35 per ton, which includes the $10 haul on the Uintah railway from Dragon to Mack. Independent shippers pay a wagon haul to Dragon in case they ship that way.

Although the Barber Asphalt company at present has the monopoly of the market, it is likely that if the Moffat road, and the road projected by the Utah capitalists, ever pass through the Strawberry valley, and the owners and miners of gilsonite veins are placed in a position to save the present $10 haul, they will then be able to secure a fair amount of business in competition with the Barber company. The rate made by the Moffat road in such a case will be probably the same as that from Mack on the Rio Grande Western, and will thus eliminate the $10 charge.

## PRODUCTION AND CONSUMPTION

The available tonnage, in Uinta county, of the pure form of crude bitumen known as gilsonite, was estimated, by the late Geo. H. Eldridge, of the United States Geological Survey, at 30,000,000 tons. The approximate annual consumption in the United States is between 8000 and 10,000 tons. This consumption seems to have increased materially during the last year or two, owing to the reduced price at which the product is now being sold.

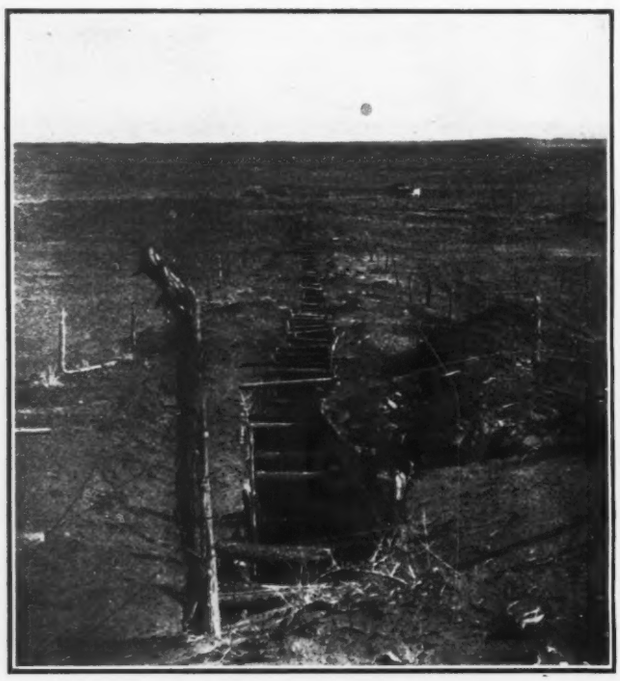

FIG. 1. WORKING THE VEIN OF GILSONITE BY THE OPEN-CUT METHOD

FIG. 2. GILSONITE SACKED, READY FOR SHIPMENT

The accompanying illustration, Fig. 1, shows the vein in the "Strip," as it is called locally, which is a piece chopped out of the Indian reservation many years ago, for the benefit of Utah men and others, for the reason that it contained a 4-ft. vein of exceptionally high-grade gilsonite. The property is now owned by the asphalt trust. The workings shown were, at the time I took the picture, about one-half mile long, and 90 ft. deep. Working underground with open lights was tried at first, but one day, at a point near the center of the length of the vein, the powdered gilsonite in suspension blew a hole in the earth, killing two men. After that, the deposit was worked by an open-cut or trench, so as to have daylight. Later

electric lights were installed, and the men worked in safety.

This vein is not now being worked, for the reason that at the lower terminus of the Uintah railroad the Dragon vein, 8 ft. wide, is supplying all present requirements. Fig. 2 shows the "whip" with which the gilsonite is hoisted and also the product sacked for shipment.

### Available Coal

The fuel famine in Utah, California and Nevada has caused the people of those States to cast hungry eyes on the 1200 square miles of coal in the Yampa field, through which the Moffat road passes, and in which it is now grading. Now, the powerful influences of the heads of the Union Pacific and the Denver & Rio Grande railroads, and their affiliated coal companies, which have hitherto been employed to prevent the Moffat road from bringing the Yampa coals into the Eastern and Western markets, will be of no more avail. The opening of these great deposits of various carbonaceous products will be of great benefit to the whole country between the fortieth and forty-first parallels of latitude, and from the Missouri river to the Pacific coast.

## Prospects of the Indian Manganese Industry †

By A. Ghose*

It is quite well appreciated by those who are interested in the manganese industry that India has recently been developing into a very important center of production. This development has gone on to such an extent that India is quite likely to become the leading producer in a few years' time. At present India supplies more manganese ore to the iron furnaces of Great Britain than any other country. The manganese exported from Indian to Continental ports is steadily increasing, and the quantities shipped to Belgian and German ports during 1906 exceeded those sent to England. Heavy shipments were made also to Baltimore and Philadelphia.

### Nature of Ores

The India ores have several important advantages over Russian ores, their most important competitor, which give them preference in smelting establishments. The India ores are noted for their compact structure, hardness, and friability. The comparative absence of dust makes the ores better handled and puts them at a considerable advantage over Russian ores, which are soft. Consequently, Russian ores when delivered at the smelters are partially reduced to a powdered state, resulting in loss in transit and further loss during metallurgical treatment.

At present there are absolutely no facilities in India for smelting ores on the spot, as the deposits of manganese ores are far removed from any sort of fuel. Consequently a considerable amount of ore is wasted every year as it is too low grade to stand transportation. However, the possibility of transporting the ore to the neighborhood of coal fields or of importing fuel to the manganese deposits is appreciated and if this possibility is realized, a much larger amount of ore can be utilized and transportation charges on the finished produce will be greatly reduced.

### Location of Principal Deposits

So far no exportation of pyrolusite has taken place from India, although this ore has been met with in some places. There is a remarkable deposit of this mineral in combination with other manganese ores at Pali, about six miles from Munsur, central provinces. The ore has yielded 62 per cent. of manganese. Pyrolusite is often met with in the Goa deposit in quantities worth exporting. The greatest part of the Indian export, however, is of psilomelane.

The manganese quarries of Vizagapatam are excellently situated near a seaport and this location has resulted in profitable exploitation of a middle-grade ore containing high percentages of phosphorus and suitable for the basic process. These quarries have been worked about 10 years. The important mines of the Nagpur district are mostly situated in the neighborhood of Kamptee, and the ore produced in that locality is of the highest grade so far exported from India, but its percentage of silica exceeds the limit of standard requirements. This disadvantage is very likely due to the preponderance of braunite in the ores of this locality. The deposit at Ramtek, Munsur, Kachurwahi, Manegaon and Kodaigaon, are all noted among others for the excellence and abundance of their ore which is mainly an intimate mixture of braunite and psilomelane. The newly opened mines in Bhandara and Balaghat are said to show extraordinary developments of orebodies and are being actively exploited. Several light railways are now under construction in order to assure a heavy export. The deposits of manganese in the Chindwara district are rich but are in a disadvantageous position on account of transportation difficulties. Another deposit of manganese ore is being worked with success near Meghnagar in the Jhabua state, central India agency.

### Minor Deposits

The comparatively unimportant superficial deposits of manganese ore in the Jubbulpur area and in the neighborhood of Chaibassa in Bengal are also being worked on account of the prevailing high prices. In the Mysore, Shimoga, Chitaldrug and Tumkur districts everything is practically in the hands of manganese exploiters, hundreds of miles having been taken up under prospecting licenses. A large quantity of good psilomelane has been exported from the beds in the neighborhood of Kumsi, which are being worked extensively and new deposits are being opened in the Shankargudda range and in the Tumkur and the Chitaldrug districts. In the Sandur state in the Bellamy district mining operations are proceeding on a large scale. The ore of this locality is non-silicious and non-phosphorus in chararacter and is in great demand.

In Portugese India the deposits are all in laterite and although there is a considerable quantity of good ore the life of the majority of the deposits is limited. Among these are the mines at Sancordem, Candiapar, Fanuswadi and Wagy. The proximity of Marmagoa harbor affords exceptional facilities for working with profit even an inferior grade of ore.

It is probable that the deposits in Sandur, and also some in Mysore, on account of their immense reserves of ore and nearness to the sea may take an important part in the world's production, and Marmagoa harbor is likely to surpass other Indian ports in future manganese exports. But the present capacity of that harbor is extremely limited and unless this defect is promptly remedied the south India manganese industry will receive a serious check. A combination of all the important mine owners in India could have averted the present competition to a marked extent, but unfortunately, such combination is now almost out of question.

*Sandur, Bellamy district, India.

†Abstracted from the *Journ.* Brit. Soc. for the Encouragement of Arts, Manufactures and Commerce (Aug 2, 1907).

## Mineral Production in Sweden

Consul R. S. S. Bergh reports that according to statistics recently published, about 4,500,000 metric tons of iron ore were produced in Sweden last year, from 308 mines, an increase of more than 130,000 tons over 1905. The county of Norrbotten comes in the first place, with the county of Kopparberg as second. About 10,490 persons are employed in the iron mines and smelteries. The production of pig iron amounted to more than 600,000 tons. For the production of forge iron and steel 97 works were in operation, against 99 in the previous year.

The gold produced in 1906 was only a little above 20 kg. All was obtained at the Falun copper works. The quantity of silver produced was 938 kg., and the most of it was produced by the Sala silver works. The production of lead was about 700,000 kg. The yield of copper shows a slight decline and was 1,209,130 kg. The quantity of zinc produced was 174,600 kg.

Rust may be removed from iron by suspending the rusted material in a saturated solution of stannous chloride, the time of immersion depending on the thickness of the rust coating.

## The Superior & Pittsburg Mine

SPECIAL CORRESPONDENCE

Perhaps the most important development in all the Southwest, surely in Arizona, is that at the Superior & Pittsburg at Bisbee. This mine has never as yet been in a position to make copper on a large scale because it has been in process of development for the past four or five years. Its copper last year cost about 15c. a pound, including charges for all machinery purchased, the cost of developing new orebodies and driving barren drifts to explore the ground, and was spread over an output of less than 1,000,000 lb. a month.

The Calumet & Arizona mine, developed in the same way, owned by the same capitalists and situated in the same formation, is making copper for about 6c. and there is every reason to expect that Superior & Pittsburg will do equally well when it is developed sufficiently. The company has four shafts down from 1100 to 1400 ft., each tapping orebodies of good size and value. Its development is still too shallow for the large deposits. It is mining oxides and carbonates, 1000 to 1200 ft. underground, and has not reached the secondary sulphides at those depths.

The mine is still pumping a considerable flow of water, the Junction and Briggs shafts handling about 3500 gal. a minute, which has been about the average flow for the past three years. This water seems to be from a great underground reservoir, probably in the porous altered limestone. It may ultimately be exhausted, but at present it continues constant; the opening of new ground seems to be about sufficient to keep the quantity unchanged.

The company is mining from three of its four shafts, the Cole, Hoatson and Junction. The Hoatson is a new property, down 1200 ft., where it is showing large areas of leached ground carrying iron and carbonates of copper. From this shaft about 100 tons a day are being stoped, and the ground is improving as the work advances. The Junction was sunk into a large orebody of copper carbonates, and it has been necessary to leave much ore surrounding the shaft and to prospect elsewhere. About 50 tons a day is raised from the 900-ft. level, and a large deposit is being developed. The bulk of the production comes from the Cole shaft, which has been mining in one orebody for about two years and has not reached the end. The company is installing a 4000-gal. pumping equipment of the Prescott type, on the 1200-ft. level of the Junction, and will ultimately handle all the water from that shaft. The Junction will also be the main utility shaft of the group, and a large machine shop has been built there this summer. The Junction and Cole shaft-hoists are Nordberg four-cylinder, inclined, 16x42-in., double reel machines, arranged for a lift of 1500 ft. and capable of reboring to give capacity for 2500 ft. They were erected at a cost of about $40,000 each. The hoists are similar to that of the deep shaft of the Tamarack mine, at Lake Superior. The Junction boiler plant consists of ten 280-h.p. marine type, oil-fed boilers.

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According to W. Kestraner the consumption of pig iron yearly per head of population in various countries is: United States, 320 kg.; Great Britain, 220; Belgium, 160; Germany, 145; France, 65; Austria, 50; Hungary, 25; Russia, 25 kg. The consumption in the United States was just twice as great as in Belgium, and nearly 13 times that of Russia.

## Hamilton Storage Machine and Car Loader

The United States Steel Corporation will shortly install in its storage yard at Gary, Ind., the Hamilton storage machine shown in Fig. 1 for handling coal and coke into and out of storage. The machine is a modification of the pit-car loader manufactured by the Hamilton Manufacturing Company, Columbus, Ohio, and picks up loose material from any part of a storage yard 100 ft. wide and of any length from 1000 to 10,000 ft. It stacks the material 40 ft. high, and re-loads from the stock pile into the railway car when the product is to be moved. In both operations it has a capacity of six tons a minute. The cost of re-handling coal and coke is less than 2c. a ton, and the machine requires no overhead structure, nor any construction besides the platform and the track on which it operates.

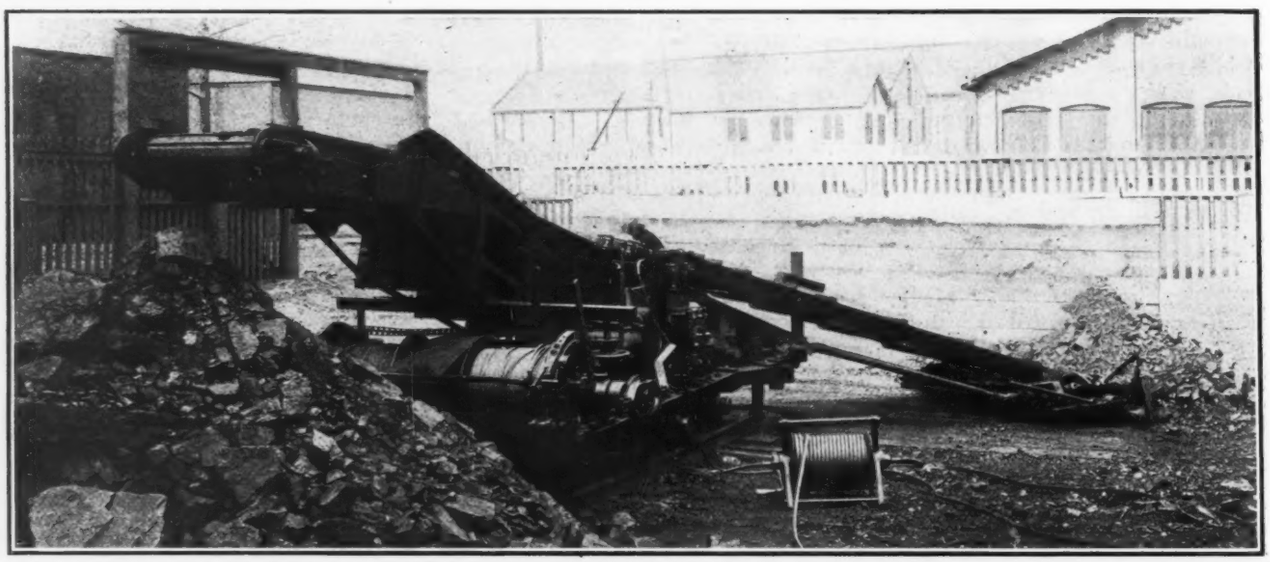

FIG. 2. HAMILTON PIT-CAR LOADER

In operation the machine does not leave its 18-ft. track. The radial sweep reaches out 50 ft. from the vertical headshaft, while the flights of the conveyer pick up and carry to the delivery conveyer the material lying in the path of the gathering plate. As the whole machine moves forward and backward by its own power, and as both the gathering and the delivering conveyers are capable of swinging in a circle about the machine center, coal may be picked up from any point of the platform and delivered to any point within the limit of the delivery conveyer.

### PIT-CAR LOADER

The storage machine is a development of the pit-car loader made by the same company. The principles involved are identical; the dimensions, however, are

different to suit the conditions of operation. One machine works in the open; the other does its loading in a restricted space. The car loader shown in Fig. 2, requires 42-in. head-space; it works in 48-in. seams and mechanically picks up run-of-mine coal at the rate of 1000 lb. per minute.

After the coal has been undercut by any of the machines in common use, the coal is drilled and shot down. Then the loading machine, which is self-propelled, moves into the room. The pony truck carrying the front end is moved and the posts for the feed chain are set up on each side of the room. The nose end rests on the floor at the edge of the coal. The car to be loaded is placed under the delivery conveyer and the sweep is started in its movement from right to left and from left to right across the room. The gathering flights pick up the coal that gathers on the nose plate and convey it to the steel belt conveyer which in turn delivers it into the car. When the cars are large and heavy the loader may be equipped with reels and rope for handling the loaded cars and empties from the face of the room to the cross entry.

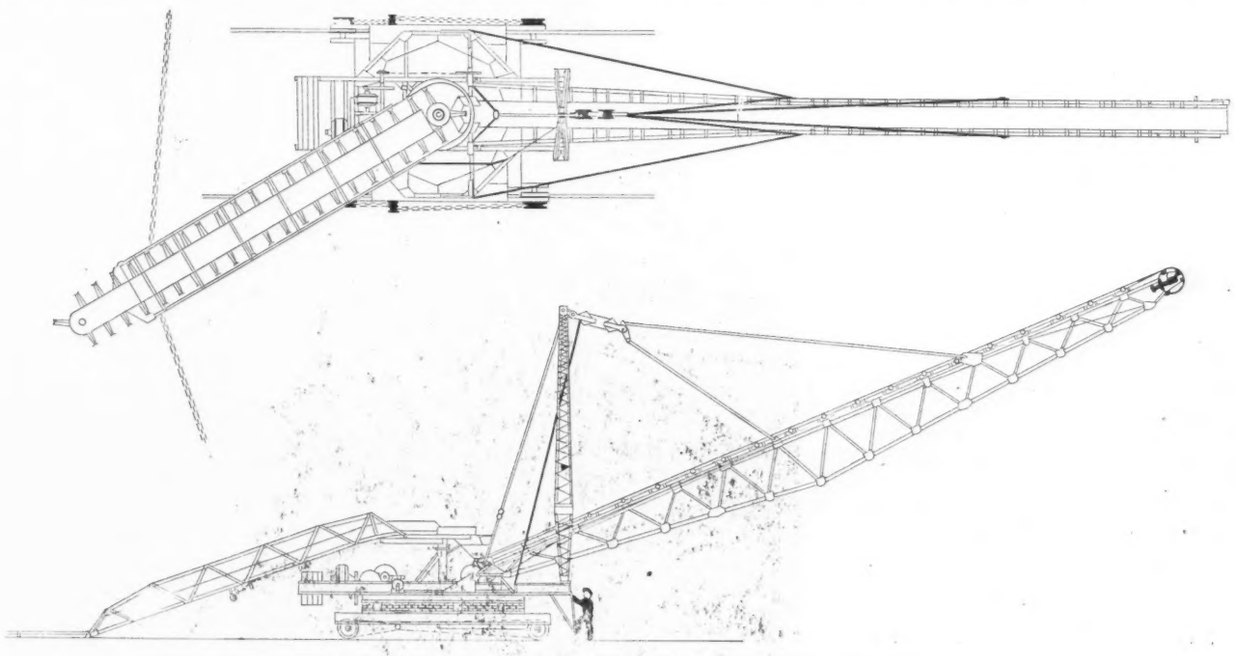

FIG. I. HAMILTON STORAGE MACHINE, PLAN AND SIDE ELEVATION

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We hear of a discovery of monazite sand along the shores of the Parahyba river in the interior of the state of Bahia, Brazil. The deposits now exploited are all on the sea-coast.

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In 15 years, from 1892 to 1906, inclusive, the Indian returns show that silver valued at £135,541,035 was imported into India, while the exports were £34,080,286. During that period, therefore, India absorbed silver to the amount of £101,460,749, an average of £6,764,050 per year.

## Production of Salt in the Uuited States

According to the U. S. Geological Survey, more salt was produced in the United States in 1906 than in any previous year, and the value of the product was greater than in any year since 1890. The quantity was 3,944,133 short tons, or 28,172,380 bbl., valued at $6,658,350, a gain of 308,876 tons, or 2,206,588 bbl., over the production in 1905. This increase in price was not sufficent, according to some producers, to offset the increased cost of labor and supplies.

In 1906, as in 1905, a large part of the output of salt was used in chemical works, as brine, without concentration into salt. The quantity of dry salt reported in 1906 was 2,603,818 short tons, or 18,598,799 bbl., valued at $6,179,666, an average value of $2.37 per ton or 33.226c. per bbl. The corresponding figures for 1905 were 2,533,467 short tons, or 18,096,191 bbl., valued at $5,702,425, an average value of $2.25 per ton, or 31.512c. per barrel. These figures show an increase for 1906 in the reported production of dry salt of 502,509 bbl., or 70,351 short tons in quantity; of $477,241 in value; and of 1.714c. per bbl., or 12 c. per short ton, in average price.

New York leads in value of output, closely followed by Michigan. The output of Michigan, however, is considerably greater than that of New York. The average net price per bbl. in New York in 1906 was 23.4c.; in Michigan, 20.3c. Ohio ranks next, followed by Kansas. In 1905 Kansas exceeded Ohio in value of output; each shows an increase for 1906. California, Texas and Utah show an increase, and Louisiana and West Virginia a decrease in value of output.

Michigan and New York combined contributed more than two-thirds (67.14 per cent.) of the total production of the United States. Of the five leading salt-producing States during 1906, Michigan produced 9,936,802 bbl. (35.27 per cent.), New York 8,978,630 bbl. (31.87 per cent.), Ohio 3,236,758 bbl (11.49 per cent.), and Louisiana 1,179,528 barrels (4.19 per cent.). These five States contributed 90.62 per cent. of the total quantity of salt produced in the country during the year.

## Coal in New Zealand

The coal production of New Zealand, as reported by the State mine inspector, in 1906 was as follows: Bituminous, 1,077,408; pitch coal, 24,961; brown coal and lignite, 627,167; total, 1,729,536 tons. The total shows an increase of 143,780 tons over 1905. There were 150 collieries reported, but only 16 of these employed over 20 persons each. The average number of employees was 3692, of whom 2518 worked underground and 1174 on surface. The average coal mined per employee was 468 tons.

The number of accidents reported was 33; the number killed and injured was:

| | Killed. | Injured. | Total. |
|---|---|---|---|
| Number | 6 | 30 | 36 |
| Average per 1000 employees | 1.62 | 8.13 | 9.75 |

The chief cause of injury reported were: Falls of coals or rock, 2 killed and 12 injured; firedamp explosions, 4 injured; shaft accidents, 1 injured; miscellaneous underground, 3 killed and 13 injured; on surface 1 killed.

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It is estimated that the total annual wage paid to British coal miners amounts to $300,000,000.

# Hoisting at the Yellow Dog Mine Near Webb City, Mo.

By Doss Brittain*

At the Yellow Dog mill on the land of the Underwriters' Land Company, north of Webb City, in the Joplin zinc district, two slow-speed, endless-chain hoists are used, operated by electric motors. One of these, at the south shaft of the mine, has been in use over two years, having been erected in September, 1905; the other was put in operation over a year later, in November, 1906. They are similar in construction, with only a few slight differences in minor details. They have been in operation long enough to test their efficiency, and have done even better work than the owners expected.

The south shaft hoist raises ore from a shaft 227 ft. deep on the incline and 165 ft. vertical depth. The shaft is 6x9 ft., inclined at an angle of 45 deg. for the greater part of its length. The hoist, or conveyer, is operated by a 50-h.p., 200-volt, 25-cycle, three-phase, alternating-current electric motor running 720 r.p.m. full load. Without an attendant it hoists 500 tons per eight-hour shift, or a little more than one ton per minute, moving at the rate of 50 ft. per minute. About 260 ft. of the hoist is underground. An automatic safety brake prevents its running backward when the power is cut off. Its essential feature is an endless chain 300 ft. long between centers of the supporting sprockets.

This chain carries 319 buckets made of malleable iron ¼ in. thick; each bucket is 24 in. long, 15 in. wide and 13½ in. deep, carrying 80 lb. of ore. The buckets are supported on each side by links 24 in. long, 1¼ in. wide and ⅝ in. thick, arranged in pairs; they are made of "Triumph" special drop-forged steel, and one of the pair is placed on each side of the bucket. The links of each pair are held together by steel bars or axles, 1½ in. diameter and 35¼ in. long; on the ends of these axles are fastened chilled wheels 6 in. diameter, with flanges 1 in. deep. These carry the buckets and run on T-rails 16 lb. to the yard; under the feeding apparatus the rails are heavier, 25-lb. section. The upper line of rails, carrying the ascending half of the chain, is fastened by ¾-in. bolts to angles 6x6x⅝ in.; the lower line, carrying the descending half, is bolted to timbers set in the floor of the shaft. The track angles are fastened to stands on each side, perpendicular to the floor of the shaft; these stands are spaced 10 ft. apart, and are 36½ in. high and 6¼ in. wide, made of two angles bolted together. They are bolted at the bottom to heavy timbers and braced laterally by angles 4x3x⅜ in., placed 16 in. below the tops of the stands, to allow the line of buckets to pass above and below. The chain is prevented from swaying laterally by tees 2½x2½ in., weighing 5½ lb. to the foot, running along the ends of the moving axles. The cups are kept in line by a bar ¼x1½ in., 10¼ in. long, fastened to each side of the cup and extending along the side of the next in line.

The upper portion of the chain passes over a 36-in. sprocket on an 8-in. axle and geared to the motor in the hoisting tower. The sprocket is so arranged that the buckets overturning for their descent empty the ore into the hopper. The chain receives its motion, as does also the feeding apparatus at the bottom of the mine, from the upper sprocket. The lower end of the chain is supported by a 48-in. sprocket which gives motion to the feeder directly by an eccentric.

The feeder is a hopper 5⅝x6⅜x2½ ft., covered by a rod screen with 6-in. openings. The hopper has no bottom and the ore passes into a trough below, the feeder proper, which has a reciprocating motion, taken from the eccentric on the sprocket axle, the speed being so arranged that the feeder will move forward once for every bucket that passes. This feeder trough is 31½ in. wide, 60 in. long and 16½ in. deep. It is carried on wheels which run on a track made of 2x2x¼-in. angles.

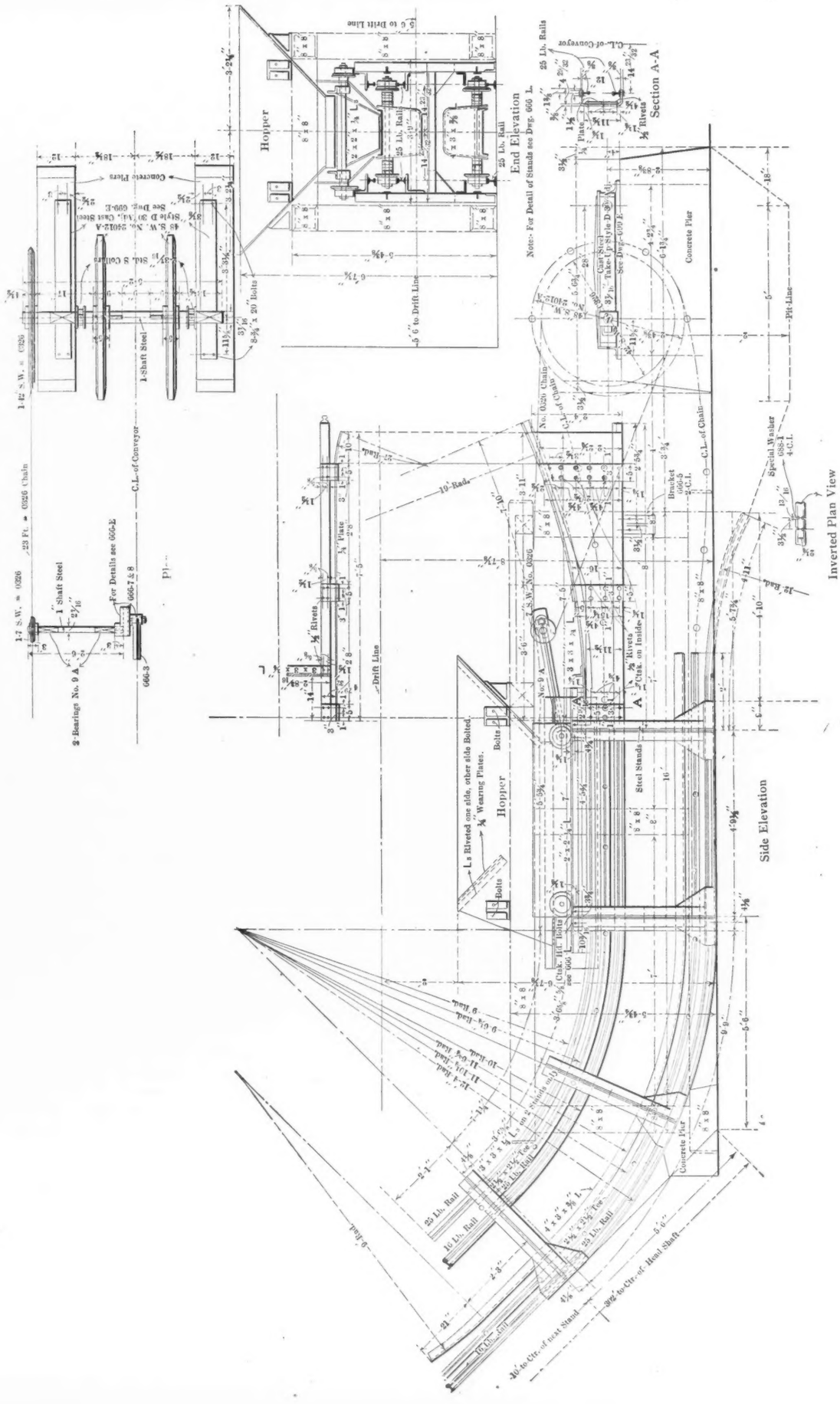
All signaling is done by an air-whistle operated from the bottom of the shaft.

The north hoist differs from the south in having dust-proof oil-chambered wheels and simpler stands, which do not extend above the plane of the upper tracks. There is consequently nothing to prevent lateral swaying. The cost of installing such a hoist as either is now about $6000.

CONVEYER-HOIST, YELLOW DOG MINE

The cost of hoisting ore by this method includes only the cost of power to run the hoist, and the repairs. As figured from 22 months of operation the costs per ton are: Power, 0.3c.; repairs, 0.1c.; total, 0.4c. To make a fair comparison between this and the ordinary methods of hoisting, we must add 0.55c. per ton

*Joplin, Missouri.




**Details of Conveyer No. 2.**
**CONVEYER-HOIST, YELLOW DOG MINE**

wages for the hoisterman who operates a small car for the lowering and elevation of men and supplies, as this work is done with the ordinary hoisting apparatus and must be included as a part of the duty of the slow-speed hoist if the comparison is accurate. This additional cost brings the total to 0.95c. per ton. Observations for the period from April 1, 1906, to April 1, 1907, covering conditions as nearly similar to those at the Yellow Dog as possible, and probably the most complete records of the cost of mining to be obtained in the entire district, show the costs of hoisting by ordinary methods to be: Power and repairs, 4.07; hoisterman, 4.70; total, 8.77c. per ton.

Estimates show that ore can be hoisted for a much lower cost than this, ranging from 2.5 to 3c. per ton; but they are made on the actual cost of bringing ore to the top under ideal conditions, and leave out of account the fact that much of the time the hoisterman is idle and is paid for a waste of time unavoidable in the ordinary hoisting methods. The actual costs, therefore, as recorded during an ordinary year of mining, in which the ore was hoisted a vertical distance of 165 ft. should be considered. By this comparison it appears that hoisting by ordinary methods costs more than nine times as much as by the slow-speed hoist if the expense involved in the necessary delays and other hindrances incident to ordinary hoisting are considered in the estimate; when ideal conditions for ordinary methods alone are considered, the cost is 4½ times as much as that of the slow-speed hoist above described.

## Determination of Insoluble Matter

L. G. Eakins (*West. Chem. and Met.*, III., pp. 120-121) has desribed the methods in use at the Colorado plants of the American Smelting and Refining Company for the determination of insoluble matter. The methods used in the laboratories may differ somewhat in unimportant details, but in general are as follows: Unless there is some special reason otherwise, one-half gram is taken in all cases for the determination.

### Sulphides

Treat in No. 0 beaker, or small casserole, with strong nitric acid, 7 to 10 c.c. Heat gently until strong action has ceased. Evaporate to dryness and bake until free from acid. Cool, add about 20 c.c. hydrochloric acid (one part acid and one part water) and heat until solution is as complete as possible. Filter; wash first with hot, dilute hydrochloric acid, then hot water. Ignite and weigh.

Occasionally, some ores high in zinc or lead sulphide may be treated to advantage first with hydrochloric acid, and then following as above, but the result should be the same in either case if properly carried out.

### Oxidized Ores in General

Treat with strong hydrochloric acid, 7 to 10 c.c. Boil until dissolved; add a little nitric acid (½ c.c. is usually plenty); evaporate to dryness and bake to the complete expulsion of acid fumes. Cool; take up with hydrochloric acid and proceed as with sulphides.

With some ores containing carbonaceous matter, it may be necessary to bake for a long time, as such residues often hold acid tenaciously. In the case of Leadville manganese oxides, nitric acid is omitted entirely.

### Leady Oxide Ores

Some of these, such as Midas and Percy La Salle, usually yield gelatinous silica and must be carefully de-hydrated at not too high a temperature.

### Oxidized Material Which Has Been Strongly Ignited

This covers such products as Cripple Creek concentrates. Digest with hydrochloric acid without boiling at first, then evaporate nearly to dryness, add a few drops of nitric acid and evaporate to complete dryness. Occasionally it may be necessary to repeat this treatment, which is a matter of individual judgment. Finally bake to complete expulsion of acid and proceed as before.

### Roasted Ores, Acid Works' Residues, Etc.

Digest with hydrochloric acid, without boiling until the oxidized portion is dissolved; add 2 to 3 c.c. of nitric acid, boil to decompose sulphides, evaporate to dryness and proceed as before.

### Ores or Products Containing Magnetite

Some mixed oxidized and sulphide ores, such as the Ibex and other Leadville ores, and also often furnace mattes, contain magnetite. When this is known or suspected, the material is treated as above under "Roasted Ores, Etc.," except that nitric acid in larger quanity may sometimes be necessary.

### Barium Sulphate Ores

Treat with 10 c.c. hydrochloric acid (one part acid and one part water), boiling a few minutes, add 4 to 5 c.c. nitric acid, and after action has ceased evaporate to dryness. Bake and proceed as usual.

After total insoluble is weighed, fuse with sodium carbonate or mixed carbonates, digest the melt with water until disintegrated, filter and wash. Wash out the fusion crucible with 3 to 5 c.c. hydrochloric acid (one to one), and with this dissolve the residue on the filter, being careful that the residue is all dissolved and the filter washed clean. Precipitate the barium in boiling solution with a slight excess of dilute sulphuric acid, and allow to stand at least two hours before filtering. The barium sulphate so obtained is deducted from the total insoluble residue.

### Precautions

Care must be taken to insure the removal of all lead salts from the insoluble residue. Filtrations should be conducted rapidly and with hot solutions, in which case washing with hot dilute hydrochloric acid is perfectly safe. However, washing with hot ammonium chloride or acetate solution is often used and has no objections. This removal of lead needs special care in barium sulphate ores, as this latter seems to render the complete solution of the lead salts more difficult. The use of Baker & Adamson No. A filter paper is recommended as less likely than most papers to allow fine precipitates to pass through.

## Production of Talc and Soapstone in 1906

Talc and soapstone are found in nearly all the States of the Atlantic slope, and in many of them the deposits are so favorably located as regards transportation and markets as to make their development profitable. During 1906 quarries were operated in Georgia, North Carolina, Virginia, Maryland, Pennsylvania, New York, New Jersey, Rhode Island, Massachusetts, and Vermont. New York, which has heretofore been the largest producer of talc, was succeeded in 1906 by Virginia, whose product now represents about 41 per cent. of the total value.

Deposits of talc and soapstone occur also in several western States, and small quantities have been quarried in California and Washington, but no production was reported from these States in 1906.

The product of the quarries varies from pure foliated talc to harder steatite or soapstone. For use in the arts it is either powdered or sawed into slabs or made into various articles. Powdered or flour talc is used in making fireproof paints, electric insulators, coverings for steam pipes, foundry facings, dynamite, paper, toilet powder, leather lubricants, and soap. Soapstone, not powdered, is used in the manufacture of hearthstones, furnace linings, laboratory tables, laundry tubs, and many other articles of everyday use.

The total production of talc and soapstone in the United States in 1906 according to the U. S. Geological Survey amounted to 120,644 short tons, valued at $1,431,556, an increase of 24,010 tons in quantity and of $349,494 in value as compared with the production in 1905.

Subjected to the action of liquid air, lead becomes elastic and can be made to rebound or serve as a spiral spring during the continuance of this low temperature.

# The Hardinge Conical Mill

By H. W. Hardinge*

After 12 years of investigation and use of the tube (pebble) mill, I realize how little is known of its possibilities today; and how small has been the advancement or improvement in the apparatus and method since the pebble mill was first brought to my attention as a crusher of ore. The results obtained in my earlier experiments pointed to possibilities which engineers have recognized by having adapted it to metallurgical requirements all over the world, where fine economic crushing is desired — mainly in cyanide work — until today this simple device is replacing stamp and roll crushing, where heretofore it was considered necessary to use the older form of reduction machinery. There is, however, a woeful waste of energy as at present applied, and owing to its sliming, the tube mill is not well adapted to concentration.

As in almost any other improvement along any needed line, there is a diversity of opinion as to the best size of mill, quantity and size of pebbles or balls to be used, speed of mill, size of material to be fed, method of feeding, manner of lining and similar questions developed by the actual practical use of the mill. These are points which economic requirements, if not actual necessity, suggest. In my own case I had occasion to question the knowledge expounded by the manufacturers as to the actual work performed by the mill.

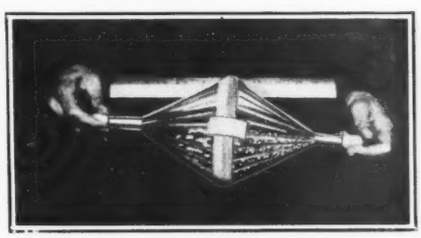
Their recommendation was generally for long mills of small diameter (4 to 5 ft. diameter by 15 to 22 ft. in length). Investigation developed the fact that they were often better salesmen than practitioners. Hence, when I had occasion to install one of my earlier tube mills, I reverted to a previous experiment with a comparatively short mill of large diameter, and finally carried the idea still further, by installing a mill 6 ft. in diameter, and only 8 ft. in length; in reference to which I wrote a short article on the action of this mill published in the Journal of June 8, 1905, from which I quote the following, as it has bearing on a mill subsequently built, and mentioned in that article, the results of which are given later:

"The tube mills now being adopted are generally longer and of less diameter than the one I use for wet grinding, which is 8 ft. long by 6 ft. internal diameter, less the silex or flint-block lining, which reduces the actual internal diameter to about 5 ft. 6 in.; this mill, loaded with 2500 lb. of flint pebbles about 2 in. in diameter, at 21 r.p.m. receives 6-mesh, ball-mill crushed material, and pulverizes it to the sizes shown in the last column given herewith, at a rate of three tons per hour, which is really more than the capacity to which the rest of our plant is adapted. In view of the fact that 2500 lb. of pebbles is not more than one-third of the supposed or theoretical load, the real capacity of the mill is undetermined.

| | Ball-Mill Product. Per Cent. | Tube-Mill Product. Per Cent. |
|---|---|---|
| Thr'gh 6 mesh on 20 mesh | 25.9 | 0.0 |
| Thr'gh 20 mesh on 40 mesh | 13.5 | 2.0 |
| Thr'gh 40 mesh on 60 mesh | 9.0 | 8.5 |
| Thr'gh 60 mesh on 80 mesh | 8.0 | 14.0 |
| Thr'gh 80 mesh..... | 40.0 | 75.5 |
| | 96.4 | 100.0 |

"A few tons of quartzose ore gave a greater grinding capacity. Tests for consumption of pebbles showed less than 1 lb. per ton of ore treated. The wear upon the lining is also slight, compared with the results obtained. Based upon my present experience, I have placed an order for another tube-mill still further from the general practice, i.e., 6 ft. long and 6 ft. in diameter.

"Experiments and discussion are needed to determine the most effective diameter and length of mill; revolution under different loads; size of pebbles; whether pebbles should be of uniform or different sizes; what relation size of feed may have to diameter of mill and of pebbles; what is the most efficient feed and discharge; whether the action is percussive crushing, or crushing-grinding, or a combination of both. The capacity and small load of pebbles in the mill I now have in use would suggest a percussive effect; certain it is that much less power is required to operate than when a larger load of pebbles is used, which would lessen the useful duty of the mill, and cause a needless attrition of pebbles and lining."



ILLUSTRATING THE SIZING ACTION OF A CONICAL PEBBLE MILL

As stated in the preceding, I then put in operation a mill, the internal diameter of which is 56 in. by 66 in. in length. This mill takes the product of the "quartzose" ore above mentioned direct from a 14x27-in. roll, without screening or returning to the roll, giving the following results:

The above result was fully up to my expectations considering the horse-power consumed and the pulp produced, when the coarse material fed to the mill was taken into consideration. It was results we were looking for, and we had no objection to their being more satisfactory than was anticipated; but I realized that we were producing a much larger relative quantity of fines or slimes than was desired for straight concentration.

For that reason I turned my attention to rectifying these undesirable accompaniments of the regulation tube mill. With this end in view (while never having been so unfortunate as to be within the mill while it was in operation) and forming my own "theory of the action of the tube-mill," I set about to construct a mill which would do away with the necessity of retaining material in the mill already crushed to size desired, which greatly adds to the internal friction, and prevents the crushing action between the pebbles by their working in a medium of more or less thick mud already reduced as fine or finer than required. My object was to have the new material fed into comparatively clear water, thus the coarser pebbles or balls would act upon the coarser material, and not waste their efficiency and the power by grinding upon the smaller pebbles, which are gradually reduced in size by the work performed, and should be discarded or made to work on correspondingly small material.

This I accomplished by having the mill built with a cone outlet, or preferably two cones placed base to base. In my smelter practice I had encountered the difficulties realized by smelter men in the feeding of a furnace by having the larger portions of the ore always seek the lower point in the furnace through the momentum of a larger body falling through space or on an incline. My model was easily constructed from two laboratory funnels of 5 to 7 in. in diameter, ribbed on the inside. First filling one of the funnels about half full of fine dry sand to coarse gravel, joining the funnels with adhesive tape, and revolving the whole on a horizontal axis, immediately a displacement of the fine material by the coarse was observed, such as might be readily anticipated. It was not, however, easy to anticipate the result obtained when the same apparatus was held at a slight inclination from the horizontal and then revolved. Herein lies a curious experiment, and a result that will not be readily understood, although it is positively apparent to the eye; let the reader try it and explain it if he can.

The results produced will be seen to be more or less of a perpendicular stratifica-

RESULTS OF 56 x 66 IN. TUBE MILL.

Mill charged with 1500 lb. of pebbles; consuming 15 h.p.; running 21 r.p.m., crushing two tons per hour.

| Mesh..... | On 10. | On 20. | On 40. | On 60. | On 80. | On 100. | Through 100. |
|---|---|---|---|---|---|---|---|
| | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. |
| Heads.... ..... | 42.5 | 22.0 | 13.0 | 5.0 | 2.2 | 2.7 | 12.0 |
| Tails..... .... ..... | 0.0 | 0.0 | 2.0 | 4.7 | 8.0 | 4.2 | 79.8 |

*Consulting mining engineer, 43 Exchange Place, New York.

tion of the ground material; which stratification, passes up the inclined outlet of the mill, from the larger pebbles working on the coarsely fed material through the smaller pebbles working upon the already partially ground material. This stratification from a metallurgical standpoint, has such a decided sizing action, that its utility will be readily appreciated, and is the basis for patents granted and applied for. In fact gradation of size is dependent upon the amount of feed, the inclination of the mill and the rapidity of discharge. To produce a finely ground material a larger load of pebbles would be required, and the mill set more approximately to a horizontal axis.

The results just obtained from a large mill constructed for fine grinding are illustrated in the following tabulation, which, considering the coarseness of the feed, the amount of pebbles used and the horse-power required, shows capacity difficult to understand although not so difficult to appreciate. Just what the maximum capacity of this mill will be, is at present unknown, as the present test was limited to the ability to feed the mill. The results are as follows:

This result was obtained upon ore brought over 1000 miles for the test, as the conditions for installing the mill were based upon the capacity, and the actual ore under consideration. The results obtained more than met the requirements. Those mills can be used singly, combined or in tandum.

RESULT OF TEST OF CONICAL MILL.

Mill charged with 2000 lb. of pebbles; consuming 15 h.p., running 25 r.p.m.; crushing three tons per hour.

| Mesh | On 10. | On 20. | On 40. | On 60. | On 80. | On 100. | Through 100. |
|---|---|---|---|---|---|---|---|
| | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. |
| Heads | 25.3 | 38.2 | 12.2 | 6.6 | 5.5 | 2.3 | 9.5 |
| Tails | 0.0 | 0.0 | 0.0 | 1.4 | 5.4 | 2.5 | 90.8 |

I predict that it will be but a comparatively short time before stamps will be considered an obsolete method for crushing ore. It is, however, clearly evident to the metallurgist that at least a proportion of the ore fed to the long regulation tube mill of today must receive a crushing upon entering the first portion of the mill which would be sufficiently fine to make a satisfactory tailing. If this is the case, why necessitate this desirable product to work its way through 20 to 25 feet of additional length of mill? The principle of reduction in a tube mill should be the same as that employed by any other system of gradual reduction, and not permit of its interfering with subsequent work to be performed by the mill.

Of course the question will be asked, "Can the sizing desired be accomplished in a pebble mill? It can. The reader may convince himself by trying the above mentioned experiment.

## The Institution of Mining and Metallurgy

SPECIAL CORRESPONDENCE

The first meeting of the Institution of Mining and Metallurgy for the session of 1907-8 was held at the rooms of the Geological Society, London, on the evening of Oct. 17. The Institution differs from the American Institute in a great many ways. One of the differences consists in the fact that the meetings are always held in one place, viz. London, and once a month, from October to May, in the evening. Every mining man connected with English metalliferous mining interests passes through London at one time or other, and puts in an attendance at these meetings. Thus the individual composition of each meeting is as varied as if the Institution traveled about. During recent years the Institution has been greatly strengthened by the increasing support of distinguished mining men and metallurgists, who supply good papers and contribute their experience and views to the discussions. The Institution has now the services of an active secretary, independent of all other influences, in the person of C. McDermid, and it is not too much to say that he deserves high credit for its present expansion.

At the meeting held on Oct. 17 the president, Prof. W. Gowland, professor of metallurgy at the Royal School of Mines, was in the chair. His first business was to announce the nomination of Alfred James as his successor as president.

The paper which occupied most of the meeting was by Prof. J. W. Gregory on the "Origin of the Gold in the Rand Banket," a very lengthy one. The author quotes and examines in some detail the printed opinions of a great many writers, such as Denny, Hammond, Hatch, De-Launay, Becker, Alford and others. He discusses the rival theories of placer deposition and infiltration, finally arriving at the conclusion—basing his judgment to some extent on the occasional occurrence in the banket of black sand—that the Rand is a fossil sea-shore deposit, such as is seen today on the coast in New Zealand.

The discussion was taken up by G. A. Denny, E. P. Rathbone, Malcolm Maclaren, Dr. F. H. Hatch, C. J. Alford, Prof. S. Herbert Cox and others. Of these speakers, only Mr. Denny supported the author, the others favoring the infiltration theory. The crystalline character of the gold, the absence of bed-rock enrichments, the presence of well defined shoots as distinct from patches, and other points were all dwelt upon and used as arguments for infiltration. Professor Gregory's contention that the sulphides present in the banket were due to sulphuretted hydrogen given off by decomposing vegetation, was scouted. None of the upholders of infiltration could give any theory as to the method of infiltration, and no analogy could be drawn from the theory of vein formations. Curiously enough, no attempt was made to connect the volcanic upheaval of the Rand region with the infiltration of the gold. Is it not possible that when this upheaval took place, subterranean waters carrying gold, silica and other substances in solution burst out and filtered down through the porous gravel beds now known as banket? The heat of eruption would make these gravel beds hot, and so prevent the immediate cooling of the waters. Such a theory would explain the comparative riches of the topmost parts of the deposits, the presence of sulphides, the subsequent cementation of the beds, the presence of quartz stringers, and the occurrence of the gold in parallel shoots.

The paper and discussion, which will be printed in the monthly bulletin of the Institution, should be read by all interested in ore deposition.

## Accidents in Michigan Iron Mines

SPECIAL CORRESPONDENCE

The reports of the mine inspectors of Dickinson and Iron counties in Michigan for the past year give the following figures:

| | Dickinson. | Iron. |
|---|---|---|
| Tons iron ore mined | 2,574,875 | 2,092,517 |
| Men employed | 3,392 | 2,511 |
| Tons mined per man | 759 | 833 |
| Mine employees killed | 7 | 25 |
| Deaths per 1000 employees | 2.06 | 9.96 |
| Tons mined per man killed | 367,838 | 83,501 |

Dickinson county showed a decrease of 104,949 tons in ore mined; Iron county an increase of 243,320 tons. The record for Dickinson county is remarkable on account of the small number of deaths among miners and it contrasts sharply with the neighboring county. Four of the accidents occurred underground and three on surface, and it is worthy of note that not one of the surface fatalities occurred while the miner was engaged in his work; two met death at a railway crossing and the third was run over by a wagon, so that none of them should properly be charged to mine accidents.

Gold with coal associated has been found in the Batrina mine in Verespatak, Transylvania. The coal, however, is found only in small amounts and not in paying quantities.

# Hoisting Ropes for Mines

## Report of the Transvaal Commission of Expert Mining Engineers and Mine Managers. Best Method of Constructing Hoisting Ropes

In March, 1905, the Transvaal Government appointed a commission to examine into several important questions relating to the operation of mines. These were the use of hoisting ropes, including the quality and manufacture of such ropes; the use of safety catches to prevent accidents from breakage of ropes, etc.; and generally all appliances for hoisting from mines. The moving cause for the appointment of this commission was the occurrence of an accident in the Robinson Deep mine, in which 54 Kafir laborers were killed by the fall of a cage in the shaft, resulting from the breaking of the hoisting rope. Previous to this there had been several similar accidents in Transvaal mines.

### Composition of the Commission

The commission was made up of engineers and mine managers of experience, appointed by the Lieutenant Governor of the Colony. Umfreville P. Swinburne was chairman and J. R. Mackinlay secretary; the other members, who acted throughout the investigation and signed the report, being Wager Bradford, H. C. Behr, J. F. Cook, E. Farrar, J. S. Fisher, George C. Fox, David Gilmour, J. A. Hebbard, Fred Hillman, W. L. Honnold, Edward Hopper, J. Harry Johns, C. J. Price, A. M. Robeson, H. Ross Skinner, J. W. H. Stubbs, S. C. Thomson, J. A. Vaughan and Edward J. Way. In addition to these, R. M. Catlin, Francis Drake, G. B. Poore and K. Schweder served for part of the time, but were obliged to resign, on account of departure from the Transvaal, or other causes.

### Proceedings of the Commission

The sessions of the commission were held at various intervals, extending from Nov. 15, 1905, to March 21, 1907. During that period a large number of witnesses were examined orally and submitted facts and opinions in writing; many communications and official documents were received from Great Britain, other European countries and the United States. The members of the commission therefore had before them records of experience in many countries, as well as in the Transvaal. Special attention was paid to the report of the British Commission headed by Sir Frederick Abel some 20 years ago; and to the report of the Dortmund Commission in Germany in 1898-1902. The German report dealt especially with safety catches.

For purposes of test and experiment the Marcus shaft of the Langlaagte Estate and Gold Mining Company was placed at the disposal of the commission.

The first portion of the report, after the general account of organization and methods, briefly summarized above, is devoted to the structure, use and care of hoisting ropes.

### Structure of Hoisting Ropes

On this point the testimony of many manufacturers of hoisting ropes was taken, and their opinions, with one exception are in favor of "Lang's lay" for ropes used in shafts when the cage or hoist is guided; that is, kept from swinging or rotating. One manufacturer, who favoring Lang's lay for general use, preferred the ordinary lay for small drums, because a larger number of wires, of smaller size, can be used in the strands; this would prevent the tendency of the wires to undo. Apart from the manufacturers, two American engineers favored the ordinary lay for all cases. The suitability of locked-coil ropes for the ordinary conditions in the Transvaal was not considered to have been established.

It is an essential point that it should be possible for an experienced person to assess the deterioration of a rope while making the customary examination. Although this can never be absolutely secured, it is considered that the rope constructed of six strands of seven wires lends itself most readily to examination. It is also the most easily spliced; besides which a more even distribution of the working load over all the component wires is assured than is the case with ropes of other constructions. The center wire of the strand may not be thoroughly effective, but it has been established by many tests that it adds to the strength of the rope, when made of high-grade steel. The limitation to the general use of the 6.6.1 rope lies, of course in the fact that, for big breaking loads, the wires would become of too great diameter. In the Transvaal its use in the medium sizes—1 in. and 1⅛ in. diameters—has been discountenanced on account of the many small-sized winding drums in use. With these the ratio of $D$ to $d$—the diameter of the drum to the diameter of the wire—becomes less than 800 to 1. There have, however, been many instances of 1⅛ in. diameter ropes of 6.6.1 construction giving satisfactory results when winding on drums of less than 8 ft. diameter. It may be stated, with an approach to certainty, that the bending stresses to which ropes are usually subjected at the Witwatersrand mines constitute—except in a few exceptional cases—an unimportant factor in limiting their lives. While there have been cases of ropes used on sheave hoists giving out through the breakage of numerous undivided wires owing to excessive bending, it is more usual in drum hoists for frictional wear or crushing stresses to be the important deteriorating influence.

### Kinds of Rope Used on the Rand

The statistics of the Mines Department show the various kinds of hoisting ropes used in the Transvaal for raising and lowering persons; about 50 per cent. of these being used to raise rock also. Of a total of 427 such ropes, 416 are Lang's lay; 5 ordinary lay; 4 flat ropes; 2 many-stranded. No ropes of locked coil or flattened strand construction are in use. The 416 Lang's lay ropes are subdivided, according to construction, as follows: 189 are 6.1 construction; 85 of 8.6.1; 69 of 7.5.1; 33 of 9.6.1; 17 of 9.3; 13 of 8.5.1; 7 of 12.6.1; 2 of 9.5.1; 1 of 9.4.1 construction.

Ropes of compound construction are largely used, and the reason for this practice may be seen in a statement of the value of $D : d$—the ratio of the diameter of the drum to that of the wire—at the shafts used for raising and lowering men. In 4.6 per cent. of the total number of hoisting ropes $D : d$ is under 500; in 6.6 per cent it is between 500 and 600; in 12.9 per cent. between 600 and 700; in 16.7 per cent. between 700 and 800; in 19.8 per cent. between 800 and 900; in 17.5 per cent. between 900 and 1000; in 21.9 per cent. over 1000. The ratio is over 800 in 59.2 per cent. of the cases; it is below 600 in only 11.2 per cent.

Whether the working conditions disclosed in the matter of bending stresses be considered favorable or unfavorable, the fact remains that the average winding rope has a far shorter life on the Rand than on other mining fields. This fact was agreed upon by many witnesses, and the reasons assigned were corrosive water in shafts, unfavorable mechanical conditions, lower initial factor of safety, and higher final factor of safety.

### "Dead" Ropes

Ropes of ordinary lay have been used successfully for sinking purposes where a "dead" rope was required, as in the case of a bucket or kibble being used. The spinning of the conveyance can then be prevented, but the swinging effects may

still occur, and these effects have been so dangerous at greater depths that sinking by means of a skip with extension runners has been resorted to. A great deal of evidence was taken dealing with the relative safety of sinking by means of a skip or sinking with a bucket.

Most manufacturers endeavor to make the rope as "dead" as possible, consistent with flexibility. Regarding the circumference of the strand as one-third of the circumference of the rope the usual practice is to vary between 2 to 1 and 3 to 1; that is, if the length of the lay of the strands in the rope is 9 in., the length of the lay of the wire in the strands will be from 4½ to 3 in., according to the particular maker's practice. Most manufacturers keep more nearly to the 2 to 1 rule, but the manager of one important factory considers, after repeated experiments, that the 3 to 1 rule is the best, this bringing the angle of the lay of the strand in the rope exactly the same as that of the wire in the strand. This rope while flexible is very dead, and this practice permits of small ropes with very fine wires being constructed Lang's lay, which, as previously stated, is otherwise impracticable, as they would become untwisted directly they were cut. Other ways of constructing a dead rope, besides ordinary lay and locked-coil, are flattened strand, many-stranded rope, or by having the wires of the core of the strand twisted in the contrary direction to the outside wires of the strand. Of all these methods, the ordinary lay seems the least open to objection, the wires being all circular and well locked together. Compared with Lang's lay, and considering that the wires at the crown of the strand are set practically parallel to the axis of the rope, and also that an individual wire comes to the crown just twice as frequently as in the Lang's lay rope, broken wires should be of more frequent occurrence, but, on the other hand, the fractures will occur at places where their detection is an easy matter, and their weakening effect is probably less, owing to the more complete locking of the wires. If Lang's lay cannot be used on account of its untwisting, then ordinary lay appears to be the next best.

### Many-stranded Ropes

With reference to the many-stranded ropes in use on the Rand, the experience of their working is at the present time too short to enable it to be decided whether they will outlast the usual make of winding ropes. The construction is 12 strands round 3 strands. The outside strands are made up of 4 wires round soft wire, and the inside strands are each composed of 3 wires round a hemp center. This rope does not rotate. The inner and outer portions of the rope are each Lang's lay, but one is left-handed and the other right-handed.

### Hemp Cores for Hoisting Ropes

If the core of a hoisting rope is of hemp, the strand cannot keep its shape under heavy pressure, such as a rope is subjected to unless it is wound on the drum in a single layer. So long as the strand keeps its shape and the bedding of the outer wires remains close, the hemp core, when well dressed initially, may assist materially in preventing internal corrosion. When deformation occurs, however, water finds its way inside the strand, the hemp gets chewed up and washed out, and conditions are then exceptionally favorable for inside corrosion.

The main core of a winding rope should be of the best hemp or manilla, of good long yarn, well soaked in boiling tar and treated with some non-acid lubricating composition. No tensile strength can be expected from the hemp core, but it should be made up tightly enough to form a firm center, that will keep the strands in place and the rope in shape under a considerable crushing pressure, such as exists when the rope is coiled on the drum in several layers, or riding turns. Cases were brought to the notice of the Commission in which the fiber core consisted of untarred jute, of short yarn and unlubricated. A rope with such a core, when working in a wet shaft, has a short life; the jute washes out, the rope flattens and gets its lay straightened out in places. The engineer has then no confidence in the even and fair distribution of the load among the component wires and is obliged to take it off, unless the damaged portion can be cut off and still leave the remaining part of a sufficient length.

Notwithstanding the condemnation of the wire center, on theoretical grounds, by so high an authority as Professor Hrabak, the Commission considers that the superiority of the hemp core is quite improved practically.

### Wire Cores

With regard to steel cores the weight of opinion is against any specially shaped core, as triangular or tape form. It is considered that these are likely to cut or nick the wires resting upon them. It is generally agreed that the cores should be circular, but there is much difference of opinion as to the tensile strength of the steel to be used in them. The best modern practice seems to be to use steel similar to, or but slightly lower in tensile stress than that of the outer wire. Tests made in the laboratory of the Transvaal Mines Department proved that a hard core wire does add materially to the strength of the rope; experience in the examination of many samples goes to show that such core wires are no more liable to fracture than those made of annealed steel or iron. Steel core wires, whether soft or hard, whether broken or not, help to maintain the shape of the strand; local evidence points to the advantage of using wire of high tensile strength.

The question as to what proportion of strength can be assigned to a steel wire core in the strand, can really only be answered correctly after examining the records of many more tests than have up to the present been undertaken. It may be remarked, however, that so long as the strength of the rope is ascertained by actual test of a whole specimen of adequate length, no uncertainty can exist on this point, the combined efficiency of the wires being then exactly determined.

When a rope of compound construction is used, the outer wires should be of as large gage as possible consistent with the size of the drum and sheave. Between the limits 6.1 and 12.6.1, in each of which constructions the wires are of the same size, there are many variations, such as 8.6.1 and 7.5.1, in which the outer wires are larger than the inner ones. Ropes made of these strands have larger wearing surfaces to meet friction and corrosion.

### Parallel and Tapered Ropes

It appears possible to construct parallel ropes of great length without any break in the continuity of the wires. Many manufacturers, however, appear to regard this as quite an unnecessary refinement, and join shorter lengths of wire together by brazing. The brazed joints in the various wires should, as far as possible, be so arranged that they are not too adjacent. The braze is made on a taper about five to seven times as long as the diameter of the wire. The heat necessary for the operation softens the wire somewhat, so that, although the actual joint may be stronger than the wire in tension, breaks often occur when the rope is in use at distances of from an eighth to a quarter of an inch from the braze.

Manufacturers differ considerably as to the best method of constructing a tapering rope. The plan most favored is to keep the same number of wires in the strands for the whole length of the rope and to make the taper by brazing on, at each step, wires of slightly smaller diameter, keeping the joints of the several wires widely distributed. The other plan is to drop out wires from time to time; for instance, one sample of tapered rope of compound construction had strands of 12.6.1 at the large end, 11.5.1 at the next step, 10.4.1 at the next, and 9.3.3 at the last stage, the innermost three wires being very fine ones put in merely for packing. In this method of construction the outer wires are of uniform section throughout, as also the inner wires. This is claimed as an advantage, especially for use with conical drums where, if the wires are not of the same size, they will be too large for use on the small end of the drum or of too fine a gage for the

large diameter. On the other hand, some of the advocates of brazing regard the older practice of dropping wires as dangerous.

The perfect method of constructing a taper rope would be to lay up tapering strands of tapering wire, but at the present time it is practically impossible to draw such wire. The tapered ropes at present supplied to the mines on the Rand number only two, and only one of these has been put to work. In view, therefore, of this limited experience, the commission is not prepared to express any preference, but it does not condemn the practice of dropping wires, which may be regarded as quite safe, if properly carried out.

*(To be Continued)*

## Synthetic Nitric Acid

In a recent consular report, Herbert H. D. Peirce, American minister at Christiania, writes as follows respecting the commercial manufacture of nitric acid by the Birkland-Eyde process at Notto-den, Norway:

I have recently visited these works where, although the entire plant is not as yet in operation, nitrate of lime and soda are being manufactured upon a scale of about 1000 tons a year, with the expenditure of about 2000 electrical horse-power. This plant has been in operation now for several years, and it is by reason of the success of the smaller plant that Mr. Eyde, the manager of the undertaking, has brought a large amount of French capital to his assistance for the larger enterprise.

Upon the demonstrated success of the process in the smaller plant work was at once commenced upon the construction of the new and large plant which was to be in operation by Sept. 1, 1907, with a force of some 40,000 h.p. furnished by the Tinfos waterfall, about three miles from the works.

The output of the new works will be about 20,000 tons of basic nitrate of lime per year. This article finds a ready market, especially in Germany, as a fertilizer. The company now finds it worth its while to convert a part of its production into nitrate of sodium, which is used in connection with certain dyeing processes. At the time of my visit the management was also in negotiation with certain capitalists for the production of concentrated nitric acid.

Not content with these works, the company is now constructing a dam at the Rjukanfos, one of the most important waterfalls in Norway, where 250,000 h.p. will be developed, taking the whole of the water from the falls, and electro-chemical works for the utilization of this great power will be built and operated. The concessions for these operations were obtained some years ago, but at present the Norwegian Storthing appears to look with alarm at the acquisition by foreign capital of the water powers of the country and has passed laws which are practically prohibitive of future undertakings of this sort by foreign capital. As local capital for such enterprises can hardly be got together in sufficient amounts, the further development of the Norwegian water powers upon a large scale will doubtless be checked for some time.

Consul-General Henry Bordewich, of Christiania, contributes an account of the process employed, as follows:

The electrical furnace is the fundamental element of the whole process. Into this furnace passes atmospheric air, where it is speedily heated to about 3000 deg. C. Inside the furnace are two electrodes, separated by a distance of a few millimeters, and through these two electrodes there runs an alternating current of 5000 volts. In order to strengthen the effect of the electrical discharge on the air and the further oxidation of the nitrogen, stress has been laid on giving the arc the largest surface possible. In a clever way the formerly known form-alteration, which the arc flame becomes subject to when influenced by a magnet, has been utilized to further this end, as the two electrodes are placed between a powerful electro-magnet.

By this method the arc is subjected to a series of very rapid displacements in a plane, which stands vertical on the line between the poles. The final result is the formation of a disk-shaped electric flame, which reaches a diameter of 1.8 m. The air sweeps this flame disk on both sides and is thereby momentarily heated to the very high temperature which is required for the oxidation of the nitrogen. Immediately thereafter the gas escaping from the furnace must again be cooled down to 600 deg. in order to avoid loss of nitrogen; but as this temperature is also too high for the apparatus which thereafter are to receive the gases, they have to be still further cooled.

The gases are led to a series of towers, the so-called oxidation towers, and from there to the so-called absorption towers, which are built partly of granite, partly of wood, and where the gases are led over limestone sprinkled with water. The product is steamed in large pans to its fusing point of 145 deg. and is thereafter poured into tin cylinders, where it congeals. In this form the product is sold to manufacturers of chemicals. They prize the product highly on account of its purity.

For fertilizing purposes the product is crushed into powder, and this stuff, which holds 12.75 to 13 per cent. of nitrogen, is the so-called lime saltpeter (calcium nitrate). It is much like common salt, easily soluble in water, and is hygroscopic. It is shipped from the factory in wooden barrels, lined inside with paper.

The production on a large scale will soon begin, and then the product will have to be offered in the world's markets. The question that presents itself, is the Norwegian lime saltpeter suitable as a fertilizer, and is it equal to the Chilean saltpeter? The experiments so far, made partly in Norway, partly in Sweden, Denmark, Germany, and France, seem with certainty to prove that lime saltpeter not only holds its place alongside Chilean saltpeter as a fertilizer, but that by its possession of lime it has certain advantages over Chilean saltpeter, especially on soil poor in that respect.

## Vincenzo Spirek

Vincenzo Spirek, one of the highest authorities on the metallurgy of quicksilver, died Oct. 3, after a brief illness, at Monte Amiata, Italy. He was born at Bubovice, near Prague, in Bohemia, in 1852, and graduated with honor from the Bergakademic at Pribram, in 1876. Entering the Austrian Government service as a mining engineer, he was employed for some time at mines in Bosnia-Herzegovina, and later was transferred to the quicksilver mines at Idria. Thenceforward he devoted himself to the mining and metallurgy of quicksilver, becoming a master of that branch of the mining industry. In connection with Exeli, the director of the mines, and Cermak, he devised the Cermak-Spirek furnace, and made radical changes in the treatment of the cinnabar ores of Idria.

In 1888 he erected a Cermak-Spirek furnace at the Monte Aminta mines in Italy, and this led, a little later, to his resignation from the Austrian service, to take entire charge of the Monte Amiata mines. Those mines were then in a declining condition, but the improvements which he introduced in the treatment of the low-grade ores restored the industry. He continued in charge at Monte Amiata until his death. Constantly at work in supervising and improving the methods in use there, in every detail, he still found time to study the industry from its broader points of view, and to make acceptable and valuable contributions to the proceedings of technical societies and to various technical publications, including the JOURNAL and the "Mineral Industry." His death is a serious loss to all who are interested in the progress of metallurgy, as well as to the operations under his direct charge.

Personally, he was a man of the strictest integrity; he was also a cultivated man and possessed a disposition which made him many warm friends.

As a remedy for headaches resultant from handling nitro-glycerin, the drinking of strong black coffee and the application of cold wet bandages to the neck and forehead is recommended in the *Mining Review*.

# The Coal-mining Situation in Northern Wyoming

## There Are in the State About 20,000 Square Miles of Coal Lands, and a Seam That Carries Gold and Silver

BY FLOYD W. PARSONS

The coal mined in northern Wyoming is of an inferior quality, running high in moisture and is consequently unfit for long storage or transportation. Some of this coal is cokable, but the product is used principally for steam and domestic purposes. The seams vary from 6 to 20 ft. in thickness, but contain numerous partings of slate and bone which necessitates care in mining to produce a clean fuel. Where the seams are more than 10 ft. thick it is generally customary to leave several feet of top coal which acts as a support for the overlying strata.

The mines are located on the route of the Burlington railway, and what coal is not used by the engines of this system is shipped principally to Wyoming, Montana and other Western markets. Some of the coal goes as far west as the State of Washington and here commands a high price, competing with coals shipped in from southern Wyoming, Australia and British Columbia; the two latter coals commanding a price of from $8 to $10 a ton.

### The Newcastle Field

One of the oldest operations in northeastern Wyoming is located at Cambria, eight miles north of Newcastle, and at present is producing 1200 tons per day. The coal horizon in this district is the lowest of the known Cretaceous formations. The seam averages about 5 ft. 8 in. in thickness and dips approximately two degrees to the southwest. There are practically no faults or intrusions, but there are a number of squeezes and rolls; several partings of bony matter are present. The product from this district is dense and heavy. There is a distinct face-cleavage, but no marked butt cleavage. This is the only coal in the Newcastle field that is considered cokable.

The seams here worked were discovered in 1888 before the completion of the Burlington road through the region. The product from the Cambria mines is now and always has been largely used in the locomotives of the Burlington railway. The deposit is unique in containing the only bituminous coking coal so far discovered in this northwestern territory, and the Cambria Fuel Company which owns and operates the mines has apparently covered the entire area of available coal within the boundaries of the 17,000 acres of land comprising its property. The coal beds are cut by a number of deep ravines which expose the coal seam at several places necessitating the building of trestles for hauling the output from one hill to another.

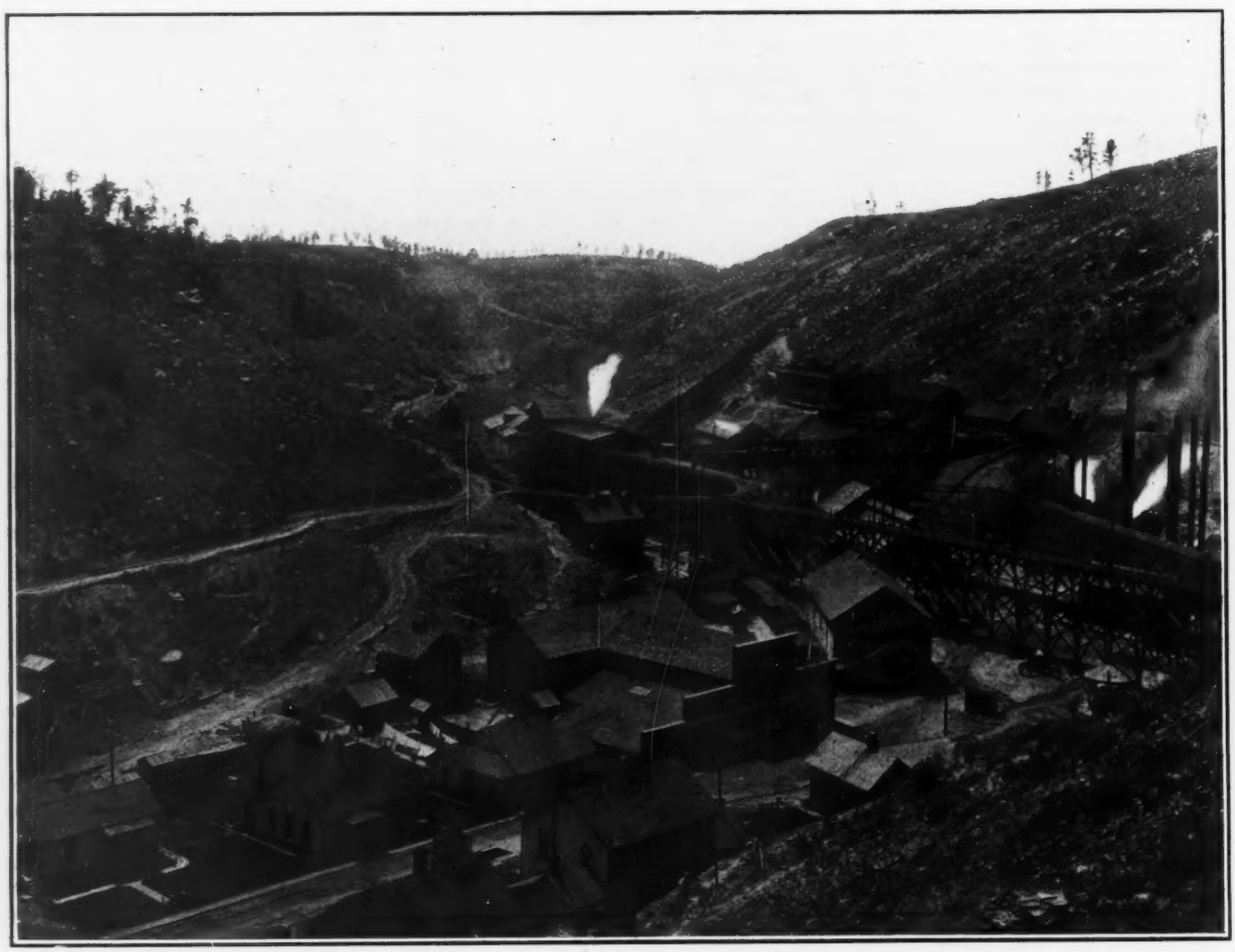


FIG. 1. SURFACE PLANT, COMPANY STORE AND MINERS' HOUSES AT CAMBRIA, WYOMING

EARLY DIFFICULTIES IN DEVELOPMENT

One of the peculiar features in the early operation of the Cambria mines is the fact that the plant was practically completed and ready to ship before the main line of the railroad had reached the district. Necessary machinery for the initial installation was hauled by teams about 170 miles from Alliance, Neb., and when the last rail was laid up the cañon from Newcastle on Dec. 4, 1889, the mines were prepared to furnish a regular supply of fuel. Since that time a steady and increasing production has been maintained and up to the present time about 7,000,000 tons of coal have been mined, of which the Burlington has used approximately 75 per cent.

The undercutting and drilling of the coal are accomplished with 40 punching machines operated with compressed air, for the distribution of which, more than 21 miles of pipe are now in service to supply the different workings. Both the "room and pillar" and "longwall" systems are used in these mines, the physical conditions in each district determining which can be adopted to the best advantage; longwall being generally adopted when the coal is less than 4 ft. 6 in. thick. The mines are entirely free from explosive gases and develop little water. The coal is gathered by horses from the rooms and hauled to the partings, where compressed-air locomotives haul the trips to the outside. The air supplied to these motors is carried through extra strong pipe at a pressure of about 800 lb. per sq.in.; charging stations are placed at points most convenient for the operation of the locomotives.

The tipple, power plant and loading arrangements, shown in the illustrations, are located in the main cañon in which the town is situated. Both the tail-rope system and a small steam locomotive are used in bringing the coal to the tipple, where, after being dumped, it is crushed, separated by both revolving and shaker screens, and loaded by gravity into railroad cars. The fine screenings are used for the manufacture of coke.

PRECIOUS METALS IN COAL

The coking plant consists of 74 bee-hive ovens having a capacity of 74 tons of coke per day. One of the most interesting and unusual features in connection with this operation is the accredited occurrence of small quantities of gold and silver in the coal, which has been found to contain values as high as $2 per ton in the coal and $5.60 in the coke; an average of 31 cars of coke, on which a special test was made, showed returns of $2.74 per ton in gold and silver.

This is a consideration to those who buy the coke for blast-furnace fuel, in smelting the precious metals, and has been a means of securing a market for the Cambria coke in the Black Hills district. The gold value more than compensates for the high ash in the coke.

THE POWER HOUSE

The power house at the Cambria mine contains two high-pressure Norwalk compressors delivering air at 1000 lb. per sq.in.; one Ingersoll and four Norwalk low-pressure compressors delivering at 75 to 90 lb. pressure. In the boiler house there are two 125-h.p. boilers, three 150 h.p. horizontal tubular boilers, one 250-h.p. and one 100-h.p. internal furnace, one 375-h.p. and one 250-h.p. Heine water-tube boilers. The blacksmith and machine shops are equipped with lathes, drill presses and various labor-saving appliances.

A remarkable feature at this plant is the operation of a pump, run by compressed air, which lifts the water about 2400 ft. with a capacity of more than

FIG. 2. TIPPLE AND YARDS AT CAMBRIA MINES. MAIN OFFICES IN BACKGROUND

300,000 gal. in 24 hours; an air pressure of 900 lb. per sq.in. raises the water to a distributing tank on the side of the cañon whence the water flows by gravity to the reservoirs used for supplying Cambria and the town of Newcastle, eight miles distant.

### Chemistry of the Cambria Coal

Physically, the Cambria coal is unusual, being hard, and partaking of the character of a bituminous shale. It is black in color, bright in fracture, and does not soil the hands. When ground into a fine powder, it develops a brown shade, much like lignite. Its line of cleavage is in the direction of its natural bedding in the formation where it is found; although it breaks up into slabs, it is, however, easily broken across the grain.

Although this coal has much in common with bituminous shale, it is probably a true coal, bordering on what is known as cannel coal. Its behavior during combustion is similar to any ordinary bituminous coking coal, except that when thrown on a hot fire, it "flies," the outer layers breaking off. The small pieces resulting from this sudden disintegration, soon become agglomerated into coke, by reason of the bituminous nature of the coal, so that this property is not a disadvantage when used as a fuel.

Like cannel coal, it readily ignites, burning with a long hot flame. To utilize its full heating power as a steam producing fuel, the flues or tubes of the boiler should be made much longer than usual in boilers constructed for the consumption of ordinary steam coals. The same may be said in regard to its use as a smelting fuel for reverberatory furnaces. Furnaces built for the consumption of this coal should be at least one-third longer than those built for smelting with New River or Pocahontas coals.

Some portions of the coal are much duller in color than others and from appearance it would seem that these were layers of shale. Such, however, is not the case. These streaks are almost cannel coal, but with a percentage of ash averaging 1½ times that of the other portions of the coal, and this is the only drawback it has in relation to the other portions of the coal in the seam.

An average sample of Cambria coal yields the following analysis: Ash, 12.49 per cent.; moisture, 3.42; volatile matter, 34.13; fixed carbon, 49.92 per cent.; only traces of lime, magnesia, iron and sulphur are found.

When specially designed furnaces are used for its combustion, this coal gives fairly good results. The only drawback in burning it in an ordinary steam boiler furnace is the loss due to the large volume of dense black smoke passing off at the chimney. This can be greatly reduced by having a clear hot fire at the bridge end of the grate, and always charging the fresh coals at the door end of the furnace, thus causing the easily disengaged gases to pass over a hot bright fire before they escape from the fire box of the boiler. A direct supply of fresh hot air near the bridge of the furnace will also help the combustion of the escaping black smoke.

### Character of the Coke

The Cambria coal produces a good, hard and compact coke, bright and metallic in color, and in most respects suitable for metallurgical purposes. It is capable of bearing a heavy crushing strain, and is therefore suitable for blast-furnace fuel; its only bad feature is its high ash content.

In attempting to reduce the high ash percentage, it has been found that there is not a sufficient difference in the specific gravities of the coal and the shale portions, to effect a good separation by washing or dry concentration. The best method is to pick the coal by hand. An average sample of Cambria coke carries about 22.4 per cent. ash. The coke yield is about 59 per cent. of the raw coal charged. A number of tests recently made also prove that this coal is well suited for the manufacture of illuminating gas, and gas for heating purposes. It is safe to say that the installation of by-product ovens would prove successful.

### The Town of Cambria

The mining company has built and maintains a well ordered mining camp, consisting of about 140 houses, which are rented to employees. No saloons or gambling houses are permitted on any part of the company premises. This feature is said to be responsible for the excellent social status for which the town is noted, and the remarkable record that no police force has ever been organized for keeping order in the community, which consists of about 1000 persons of many nationalities. The company is capitalized at $1,000,000 and employs 360 men.

It is probable that unless new developments are started in adjacent territory, the output of the Cambria Coal Company will show a gradual reduction in tonnage as well as a falling off in the character and quality of the product. None of the ovens are at present being operated and the coal contains larger quantities of impurities than were previously noted. The policy of spending money and installing the most up-to-date equipment has lately been abandoned and the main effort

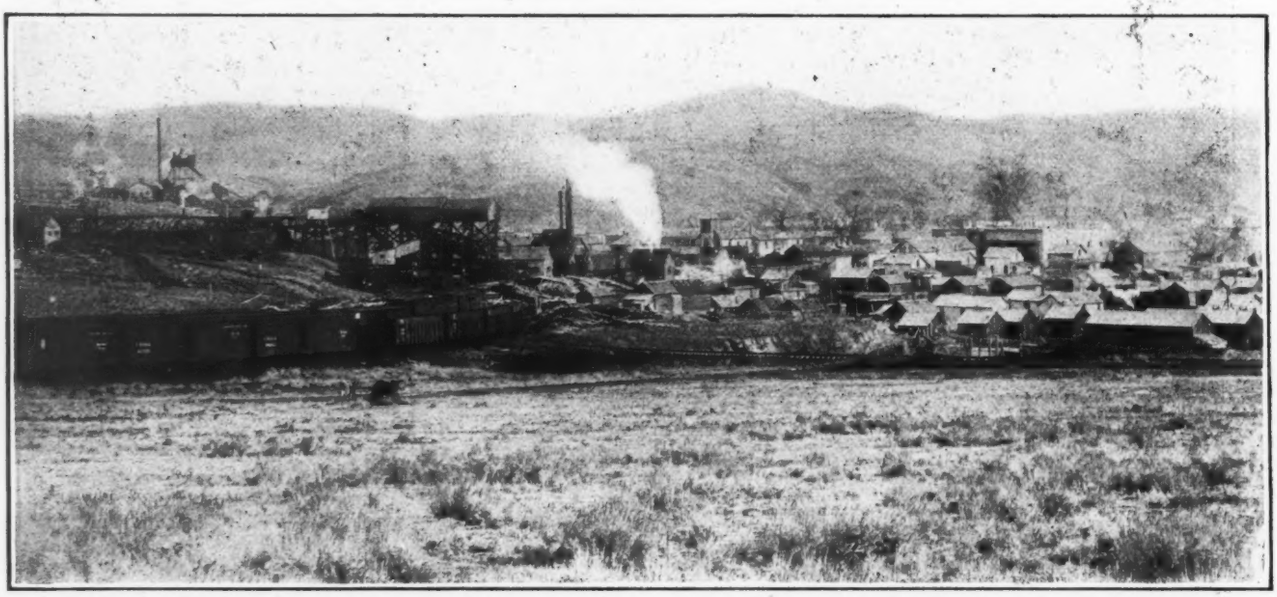


FIG. 3. MINES NOS. 1 AND 4 OF SHERIDAN COAL COMPANY, AND THE TOWN OF DIETZ, WYOMING

seems to be directed to keeping the plant in an average productive condition. It is said, however, that new beds are to be opened and if this is done and considerable money spent on necessary improvements no further falling off in production will occur. It is conservatively estimated that the property still contains more than

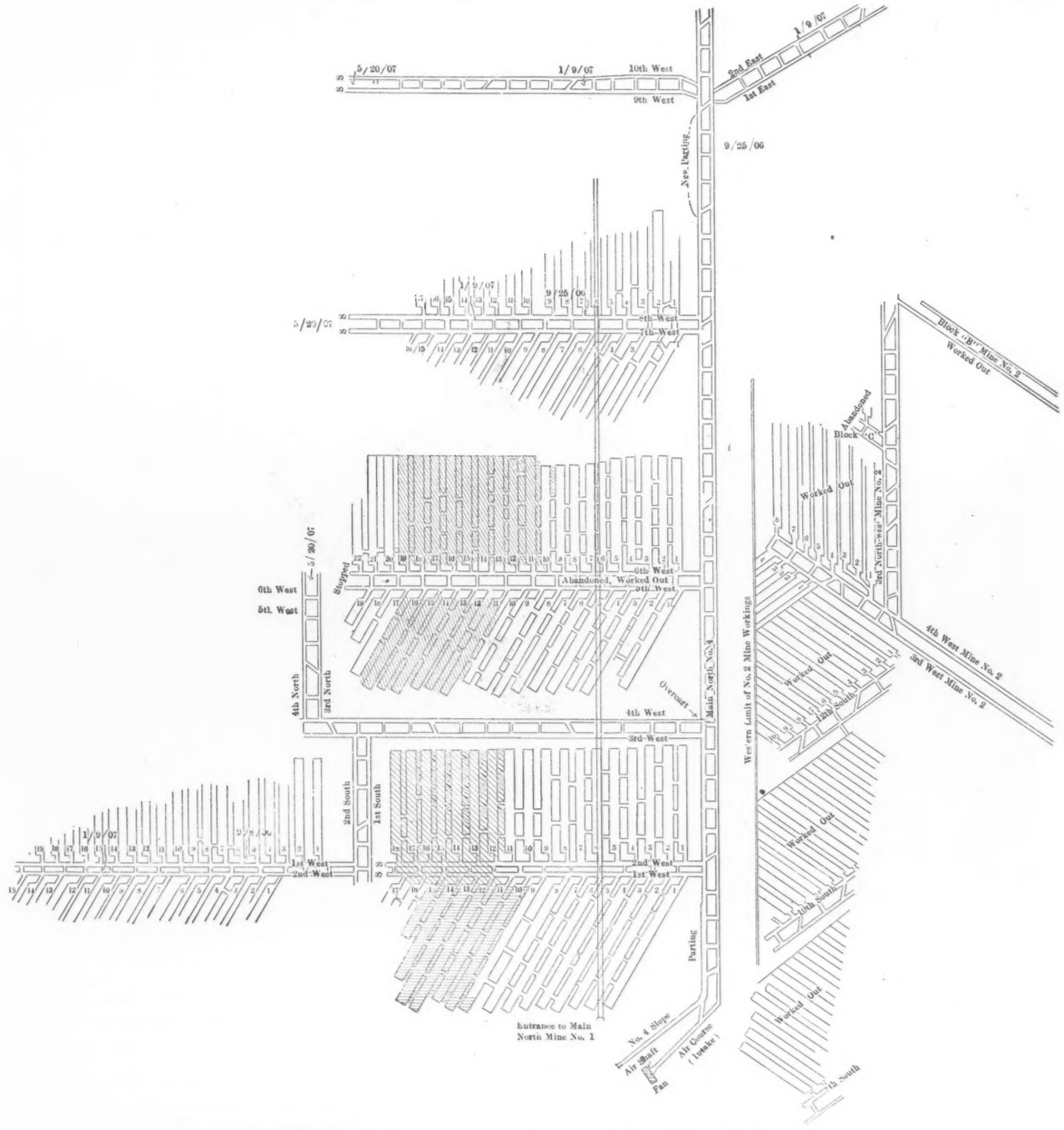
age of labor, and not a scarcity of railway cars, is responsible for the curtailment in output at the Cambria mines.

Much of the success in handling labor that has marked the operations of the Cambria company has been due to its liberality in the treatment of employees. As an example of this policy the company

is the case at all mines located in isolated districts. One other commendable feature is the closing of the mines on Sundays, a practice unusual in the Black Hills.

### The Sheridan District

The coalfield in northern Wyoming which at present yields the largest output,




MINE NO. 4 OF THE SHERIDAN COAL COMPANY, DIETZ, WYOMING

30,000,000 tons of coal. To show the need of fuel that prevailed throughout the Northwest during the past winter, it is only necessary to state that the town of Newcastle, situated eight miles from the Cambria mines, had considerable difficulty, at times, in securing a sufficient supply for its own immediate needs. A short-

in 1903 erected a large bath house equipped with bath tubs, shower baths, individual sinks, with hot and cold water always on tap at each, and 250 lockers in which the miners can keep their clothes while at work and change at night before returning to their homes. The general store is owned by the coal company, as

lies on the route of the Burlington railway about 150 miles west of Newcastle. The coal in this field is a lignite and so far as fuel efficiency is concerned, the product is far inferior to the coal produced at the Cambria operations. This field is comprised in one of the largest coal territories in the United States. The beds

extend south into central Wyoming and northeast into Montana and North Dakota.

About 65 per cent. of the coal mined in the Sheridan district is shipped west to Montana, while the remainder goes to Wyoming, and east to the Dakotas and Nebraska. So far as transportation and storage is concerned this coal is less satisfactory than the fuel produced at Cambria. An average sample of Sheridan coal when analyzed will show, volatile matter 33 per cent.; fixed carbon, 47; moisture, 17; ash, 3 per cent. The coal seams are fairly free from partings and are easily mined. The coal does not show face and butt cleavage and consequently can be worked in any direction.

The coal-bearing strata throughout this field consist of soft sandstones and clays, with some beds of harder sandstone. Only on the eastern and western edges of the field are the strata inclined, and the coal beds in the interior lie practically horizontal. The coal by reason of its high moisture content rapidly disintegrates on exposure to the air, and the product from this same field further north will hardly stand transportation at all. Where this coal has been used as a locomotive fuel, specially designed fireboxes and grates have been employed.

### Coal Mines at Dietz

The Sheridan Coal Company is the largest producer in this field; it operates five mines in the vicinity of Dietz, five miles east of Sheridan on the Burlington railway. At present, the daily output is approximately as follows: Mine No. 1, 1400 tons, including the output from No. 4 which is loaded from the No. 1 tipple; No. 2, 1200 tons; No. 3, 200 tons; No. 5, 1200 tons; total, 4000 tons.

The output of these five mines could easily be made to reach 5000 tons if the company could secure sufficient miners. The equipment and development work necessary to raise immediately the production 1000 tons above the present output, is at hand. Generally speaking all nationalities except negroes are employed in these mines and the organized labor scale is one of the highest in the United States.

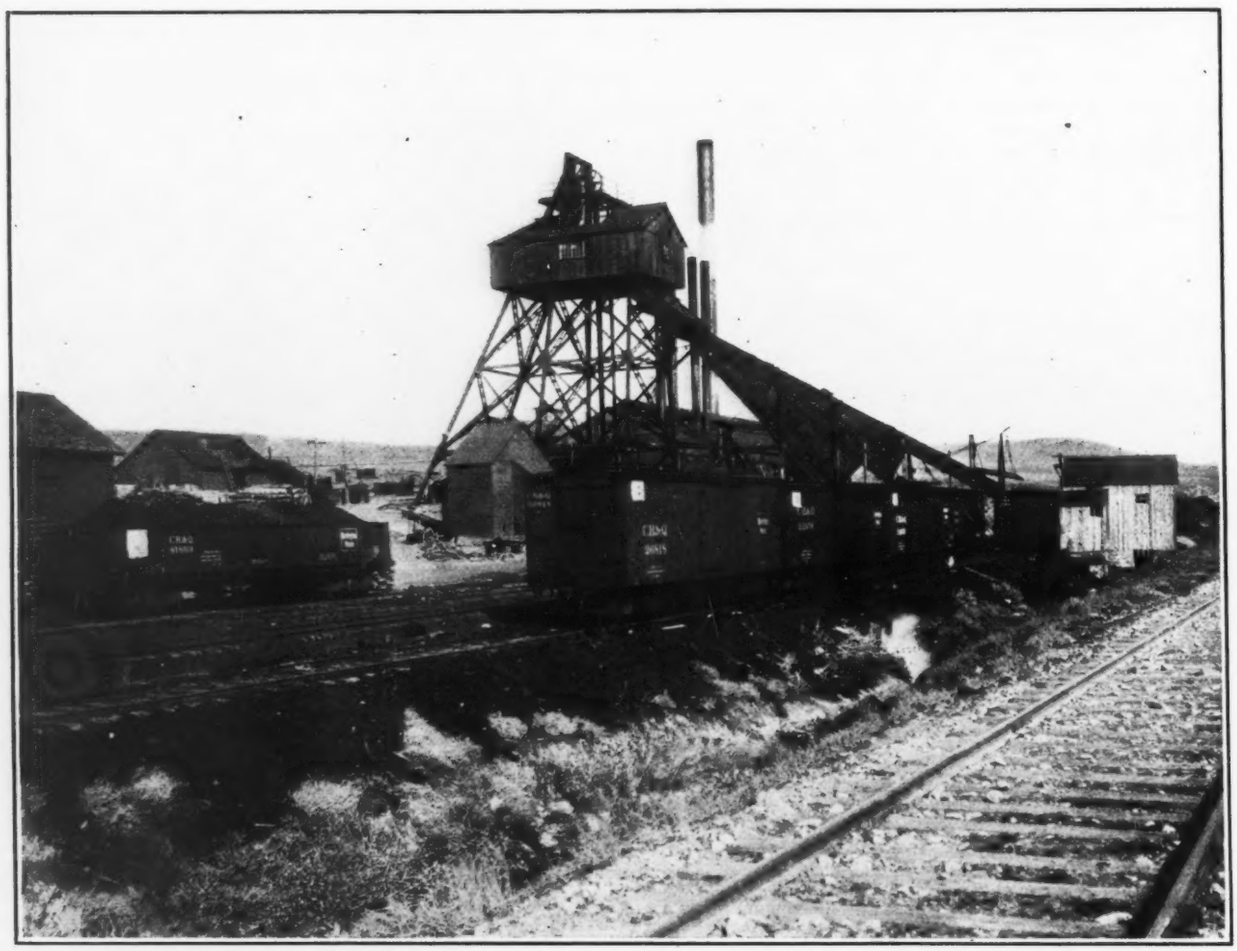


FIG. 4. MINE NO. 2, SHERIDAN COAL COMPANY

### Methods of Mining

The room-and-pillar system of mining is used generally at the mines of the Sheridan company. At No. 4 mine, which is one of the best developed mines in the district, the panel system is employed, 18 rooms being driven in each panel. The most marked improvement in the method of development is shown at this property. The old system of working was to drive rooms advancing and to take out the pillars on the retreat. After carefully studying the conditions at this mine and having to contend with numerous squeezes, the present management decided to drive the entries to the limits of the property and then to drive rooms and take out pillars on the retreat. A map of No. 4 mine accompanies this article.

The success which has attended the inauguration of this plan has clearly demonstrated the wisdom of such a change. No squeezes and few falls of roof have recently occurred and although the initial yardage cost has run higher there has been greater safety afforded the men, less timber used and more coal obtained per acre.

The main entries are driven 9 ft. wide with 36-ft. centers; cross entries are run on 30-ft. centers and are from 8 to 10 ft. wide. Crosscuts occur at 60-ft. intervals. All rooms are driven with 8x18 ft. necks and are about 250 ft. in length. The width of rooms is 22 ft. and all chambers are stopped at a specified distance so as to leave a 50-ft. barrier pillar protecting the main and cross entries.

All the mines are ventilated by force fans averaging about 20 ft. in diameter. The general plan of using doors on the

main haulway is not economical. In the No. 4 mine one overcast has been installed while two doors, necessitating trapper boys, are used on the main entry. Each of these boys who attend to opening the doors receives $1.50 per day which cost in a year would build three overcasts and thereafter eliminate the delay, danger and inconvenience of doors.

The roof in the No. 4 mine is generally good, but in most places top coal is left in to further support the overlying strata. The coal seam averages about 10 ft. in hight and from 7 to 9 ft. is usually worked. There are three partings; one small parting occurs about 4 ft. from the bottom, another one-half inch parting occurs about 7 ft. from the bottom and the third parting is near the top. The coal, generally speaking, is unusually clean and has no perceptible cleavage.

Considerable timber is used in the rooms but practically none in the entries. Most of the coal is undercut and little shooting on the solid is practised. The usual undercut is about 15 in. high and 6 ft. deep. Air punchers are used at the No. 2 mine while all other operations employ pick work.

### Handling the Coal

The coal in No. 1 mine is entered by a drift; Nos. 2 and 3 mines employ shafts 175 ft. deep; No. 4 mine has a 20-deg. slope 300 ft. long, while No. 5 mine has a 7 per cent. slope 1250 ft. long. Self-dumping cages are installed at each shaft. In handling the coal underground electric haulage is employed at Nos. 1, 2 and 4, while mules are used at Nos. 3 and 5. As is generally true throughout this field, the mines are practically non-gaseous. It is said that some little gas has been found in the No. 3 mine but the quantity has been too little to cause alarm. Some water is encountered in the No. 3 mine and both electric and steam pumps are used for handling it.

In the underground electric haulage, 250 volts are employed. In the No. 4 mine, two 4-ton motors and one 12-ton motor are used. The 4-ton motors haul six cars while the larger motor hauls about 15 loads. On the main entries 45-lb. rails are used while 20-lb. steel is laid on cross entries. The road bed is carefully graded and is one of the best I have seen in the West. In hauling the cars up the No. 4 slope a 1¼-in. rope is used; seven cars of 2½ tons each go to make up a single trip.

The arrangement for handling the coal on the tipple is similar to the general plan largely used throughout the West: The loaded cars after coming from the mouth of the mine run by gravity to the tipple and after being dumped return on a slight incline to a swag where a chain with dogs engages the axle of the car and hoists the empty to an elevation from which it can descend to a siding and be made up with the trip of empties again to enter the mine. Shaker screens are generally employed and are supported by a framework entirely separate from the main tipple building.

There are at present five known and workable coal seams in this district. The Sheridan No. 1 mine works the No. 1 seam, while mines Nos. 2, 3, 4 and 5 operate on the No. 2 bed. About 100 ft. below the No. 2 seam is the No. 3 bed which shows about 15 ft. of good coal. The No. 4 seam lying below the No. 3 is 28 ft. thick and has two small partings. The No. 5 seam still farther down is 21 ft. thick and also shows a parting of slate. The mines adjacent to those at Dietz operate on the No. 3 and No. 4 seams.

### Labor and Transportation

The demand for labor at the mines of the Sheridan Coal Company is probably more urgent than at any of the adjacent operations. There seems to be no particular reason for this local condition except that the coal is lower and the houses are older and less desirable. During the past summer the public was educated to lay in a supply of coal for winter use and some activity along this line was shown. For this reason the immediate district supplied by these mines may not suffer this year as was the case during the past winter. The coal companies took advantage of this out-of-season demand and averaged about five days' work per week all summer. There was in this district during these months an ample supply of cars, which favorable condition lasted until Sept. 14. The mine operators were elated but soon found that their troubles had not ended, for after furnishing the cars and pulling them away, the railway companies did not succeed in delivering the coal to the purchasers, but instead had large quantities of it laid up on the many sidings along the main line.

This condition was a direct result of a lack of motive power and trackage facilities. Cars of beef lay in the Sheridan yards so long that it was necessary to reice three and four times to keep the beef from spoiling. It is also true that some cars of coal after having been loaded and hauled some distance were placed on sidings and not a wheel moved for 30 days.

If coal during the winter months is to be moved with promptness it will have to be placed in a class with perishable goods such as beef and fruit and even then there is likelihood of delay in transportation.

## New Canadian Coal Enterprise

Consul J. E. Jones, of Winnipeg, reports the formation of the Great West Coal Company, with headquarters at Port Arthur, Ontario, to acquire 12,000 acres of coal land in Alberta, which is said to be the best coal land in the Northwest. The company has acquired the charter of the Great Western Railway, which extends from Calgary through the coalfields to the international boundary.

## Welsh Coal Mining Prosperity

Vice-Consul A. S. Phillips, reporting from Cardiff, says that the coal trade throughout the South Wales coal field continues to improve, the prices are going up, advances in wages cheerfully conceded, and the future is very promising. The best large steam coal is being firmly quoted, per ton f.o.b., up to $5.84; the cheaper qualities, $3.71, and the best bunker small coals, $3.22. The high prices are not due to any artificial inflation, and there is no likelihood of any great and sudden reaction. The coming of winter will have the tendency to increase rather than decrease the volume of trade, which will help keep the prices firm and probably bring on further advances. Exports for the quarter ending June, 1907, were 7,451,271 tons, showing an increase of 610,507 tons over the same period of the year previous. The increase over the first three months of 1907 was 80,012 tons. The number of new schemes in the South Wales coal region for the development of the commercial and industrial interests, the number of new collieries that are opened, and the apparent activity in older ones are the favorable result. At the last meeting of the conciliation board a 5 per cent. advance, beginning with Sept. 1, was readily granted to the workmen, in addition to an advance three months ago of 11¼ per cent.

## The Lens Collieries, France

The Mining Society of Lens in the Pas de Calais, is the largest coal-mining company in France. It produces over 3,000,000 metric tons per annum or between 9 and 10 per cent. of the entire production of the country. There are 16 working shafts, employing over 13,000 miners. There are 19 miles of main underground railroads and the equipment includes 29 mine fans, 20 air compressors, 39 haulage locomotives and over 350 rock drills. Practically all the coal is mined by hand. The veins pitch at a steep angle, are badly faulted and average about 33 in. in thickness. Horizontal galleries, 6 ft. 6 in. high and about 9 ft. wide and from 65 to 175 ft. apart, are driven along the vein from the main roadways, the upper portion in the solid rock and the lower portion in the coal. The coal in the vein is mined between these galleries, from the lower to the upper. This is modified stoping. The roof, which is weak, is carefully supported by props and broken rock brought in for this purpose. Shoots or passageways are left at intervals, down which the coal is dropped to the lower gallery and loaded on cars. Ventilation is controlled by doors at the foot of each shoot so that the air follows the working face.

# Colliery Notes, Observations and Comments

## Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

## DEVELOPMENT AND MANAGEMENT

A hose on the suction side of a mine pump should be securely fastened at intervals of its length; otherwise holes are likely to be worn by sharp projections of rock against which it is rubbed by the vibration.

It is reported that a 7-ft. seam of a fine quality of coal has been discovered near Valdivia, Chile, at a depth of 100 ft. It is the thickest bed discovered thus far in Chile, the one at Lebu being from 4 to 6 ft. and that at Lota from 4 to 5 ft.

Portable electric lamps have been introduced in some of the mines in the bituminous coalfields, but their use has not as yet become at all general, because they are more expensive than the ordinary safety lamp. The main drawback in the use of electric lamps is that they give no warning as to the presence of fire damp or black damp.

From numerous tests made by Prof. Bernhard Kirsh, of Vienna, Austria, the following conclusions have been drawn. The ultimate strength of a rope is greater than a cable. Untarred rope and cable are stronger than tarred. The average breaking strength of a rope 1 in. in diameter is: Italian hemp, 9910 lb.; Hungarian hemp, 9292 lb.; manilla rope, 7100 lb.

In Europe and the United States the use of rope for the transmission of power is increasing rapidly. Advocates of this method of power transmission cite the following advantages: 1. Transmits larger amount of power. 2. Runs smoothly and quietly. 3. Can be run in any desired direction or any distance. 4 Absence of electrical disturbances. 5. Absence of slip. 6. Cheaper in first cost and maintenance.

All manila rope used for transmission of power should be laid with a tallow and plumbago lubricant. The plumbago reduces the internal friction in bending over the pulleys while the tallow makes the rope partially water proof. Rope so treated is not materially injured by exposure to the weather. It is claimed that rope for such purposes should have four strands, as it wears better and lasts longer than the three-strand rope.

Investigations made by the Government fuel testing plant at St. Louis show that commercially valuable briquets can be made from slack coal, by mixing with 5 to 8 per cent. of coal-tar pitch at a temperature sufficiently high to melt the pitch. But it was found that briquets could not be manufactured at a cost of less than $1 per ton; so it does not pay to undertake the manufacture unless there is a margin of at least $1 between the cost of the slack and the lump coal.

The life of a wood stave pipe depends largely upon the pressure maintained, and upon the life and strength of the steel or iron bands which bind the staves together. Wood for pipes should be soft, susceptible of easy saturation and free from sap and black knots. When under pressure the outside of the pipe should be damp at all times as this shows complete penetration of the water. The steel or iron bands used as binders should be protected by a coating of asphaltum paint. If the entire outer surface of the pipe is thus coated the decomposing action of the water and air will be largely prevented. Canadian white pine has been found to be an excellent material for wood piping.

An official publication relating to mining in the United Kingdom gives the following facts. The total number of persons employed in and about all the mines of the United Kingdom in 1906 was 912,576, of whom 882,345 worked at the 3278 mines under the coal mines act and 30,231 at the 715 mines under the metalliferous mines act. Compared with 1905 there was an increase of 23,972 persons at the former and of 1080 persons at the latter. At the coal mines 80 per cent. worked below ground, while of the surface workers 3.16 per cent. were females. The total output of minerals under the coal mines act was 265,204,716 tons, an average per undergound employee of 374 tons, an increase of 13 tons as compared with the preceding year. The death rate of the underground workers under the coal mines act was 1.42 per thousand, against 1.49 in 1905.

In operating a shearing machine in a room or an entry, it is best to begin at the top of the seam. The machine is so designed that the best results are secured by making the first cut at the top and then letting the machine down sufficiently to make another cut. To get a firm and rigid support two main columns through the center of gravity of the machine are commonly used. The frame is then clamped tightly to the columns in order to hold it in place. The front end of the machine should be steadied by two auxiliary columns. All four columns should be so constructed that their length may be varied according to the thickness of the vein. The capacity of a machine depends upon the character of the coal and the condition of the mine, but under favorable conditions from 75 to 125 ft. per nine-hour shift is considered a fair average cut. The dimensions of a single cut are as follows: hight 3 ft., depth 5 to 8 ft., width four inches.

Many blasters have been slow to adopt electric firing, because of failure to understand how simple it is and how much better than the old method of firing shots. The necessary outfit is not expensive and with proper care lasts indefinitely. The time and labor required to prepare an electric shot is about the same as when the old way is used, but there is a great saving in explosive and in the time of the workmen besides greater safety and reliability. Explosive experts are well agreed that there is a saving of 20 to 30 per cent. of dynamite by firing single-charged holes simultaneously. The advantage is further increased in certain kinds of work by double-charging the holes. For instance, if the rock at the top of the face is much softer and contains more seams than the bottom, the bottom of the hole should be charged with 50 to 60 per cent., tamping put in, and further up a charge of about 40 per cent. should be put in. Each charge should contain a fuse.

The Courrières collieries situated near Lens, France, have a method of timbering which reduced the death rate from falls of ground, during the ten years preceding 1899, to 0.15 per thousand persons employed under ground, while in Great Britain the death rate during the same period was as high as 0.79 per thousand. This system consists chiefly in timbering systematically the whole of the working places. All workmen are furnished with three iron bars, 1⅜ in. square, and 4 ft. 3 in. long, which when driven over the last bar form a temporary shield in advance of the timber. The main bars, which are about 8 ft. long and are supported by three props, are set in rows 3 ft. 9 in. apart, parallel to the face. Smaller bars placed 12 in. apart and resting on the main bars and fixed at right angles to them span the space between the rows. The iron bar is driven over the main bar toward the face and thus a temporary support is formed. These iron bars, which are driven forward as the face advances and are never more than 8 in. behind the coal, are held in position by wedges from the back; thus every square foot of the roof is always supported.

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## The Lead Market

The situation in the lead market, which for many months has been unsatisfactory, has failed so far to show any evidence of improvement, in spite of strenuous efforts to enforce a curtailment of production. The largest independent producers in Idaho and Missouri have refused to make any restriction; the American Smelting and Refining Company and the United States Smelting, Refining and Mining Company have succeeded in effecting some reduction in output by discouraging the delivery of lead ore; the Federal Lead Company, of Missouri, has reduced its production. But in spite of these measures the stocks of refined metal, about 4000 tons at the beginning of 1907, have increased, especially since the mid-year, until today they amount to 25,000 to 30,000 tons.

The slackening in the demand for lead has created new conditions in the market. For several years upward of 90 per cent. of the lead produced from domestic ores has been refined and sold by three interests, chief among which is the American Smelting and Refining Company. The market price has been practically controlled by the latter, inasmuch as the price fixed by it was adopted by the other large producers. A comparatively small amount of lead was sold during 1906 by independent dealers at prices higher than those of the trust, but the total volume of this business was insignificant in comparison with the great production marketed on the established terms. The trust showed great moderation at that time in not marking up prices when it might easily have done so.

It has been fully recognized, however, from the beginning that the apparently successful regulation of the price of lead by the American Smelting and Refining Company was based on a generally rising market; and that the test of its control would develop on a falling market. This has been proved by the experience of recent months. When the demand became slack, independent producers, who previously had been selling at the trust price, began to undersell, and manufacturers whose contracts expired decided to take their chances in the open market, so that the latter acquired a magnitude greater than for years past. At the present time it is the market in which competition is active and wherein is transacted the bulk of the business not previously arranged by contract.

Consequently there are now two markets for lead, viz., the trust market, in which deliveries are made under contract at the selling price fixed by the trust; and the open market in which wholesale trading is done in the ordinary way. The difference in prices between the two markets has steadily been increasing under the pressure of the independents to sell their product until now the open market stands about ¼c. per lb. below the trust price. We have been quoting the two markets in our weekly report, but heretofore have been giving only the weekly range of the open market. In view of its present importance we shall hereafter give the daily quotations of the open market as representative of the situation in lead, reporting also the quotations of the American Smelting and Refining Company. As explained above, the production of lead is going into consumption on both terms, but it is to be remarked that a large part of the lead of the trust is contracted with its own manufacturing subsidiaries.

## The Steel Corporation's Latest Purchase

The purchase of the Tennessee Coal, Iron and Railroad Company by the United States Steel Corporation, which was made last week in a rather sudden and unexpected way, is an event in the iron trade rather of prospective than of immediate importance. It is the first entrance of the Steel Corporation into the South, for it has heretofore held no property in that section, and reported negotiations for control have always been promptly denied. It does not carry with it the control of the Southern field, as there are several other important companies operating there, though the Tennessee was the largest of all the Southern concerns.

The immediate addition to the Steel Corporation output is not proportionally large. Last year the Tennessee company made 641,887 tons of pig iron and 401,882 tons of steel ingots; those quantities being eual to 5.7 and 3 per cent., respectively, of the Steel Corporation's output. Improvements and additions already begun are expected to increase the totals to 1,000,000 tons of pig iron and 600,000 tons of open-hearth steel, within another year,

and will provide facilities for working up the steel into rails and other finished forms. The plants are well placed for supplying demand in the South, and the railroads and manufacturers of that section can absorb the material without difficulty.

A minor result is that the purchase will bring the Steel Corporation into the market as a seller of merchant iron for the first time. Heretofore it has been a buyer and not a seller, since the blast-furnace capacity has been its weakest side. The sale of pig iron, however, will be probably only a temporary condition. Already the steel works absorb more than two-thirds of the Tennessee company's make of pig; and with the improvements in the steel plants finished, there will be little surplus iron to sell.

The main value of the acquisition is in the supplies of raw material controlled. The policy of the Tennessee company has been to secure iron-ore reserves wherever possible in its territory. It now owns by far the largest quantity of ore existing in the United States anywhere outside of the Lake Superior region. An expert careful estimate of the iron ore unmined in the lands which it controls is 700,000,000 tons. This ore is of lower grade than the Lake Superior ore; but the company also controls coal lands estimated to contain 2,000,000,000 tons, and the proximity of the coal and iron-ore deposits, reducing transportation to its lowest possible limit, goes far to offset the lower tenor of the ores. The Southern ores are, almost universally, above the bessemer limit in phosphorus, and steel making there is necessarily confined to the basic open-hearth process. The use of the open-hearth furnace, however, is quite in line with the Steel Corporation's recent developments. With the reserves it has now acquired it has added largely to the hold on the raw material of the iron industry, the control of which has, apparently, always been its object. Viewed in this light the opportunity which was presented by present financial conditions was willingly taken.

The purchase is made by the issue of second-mortgage bonds which—with existing liabilities—will add about $2,500,000 to the yearly fixed charges which the corporation has to meet. There is no doubt, however, that with proper management the property purchased can provide for these charges without difficulty. Moreover, the iron-ore control is an asset the value of which can hardly be estimated in money.

## The Price of Silver

Until the opening of October silver seemed to be the only metal which maintained its market price at a high level. Through nearly the whole year of 1906 the price rose gradually, the monthly average in New York having advanced from 65.288c. in New York in January to a maximum of 70.813c. in November. From that point there was a gradual recession for several months, and in April the monthly average had fallen to 65.462c. This was followed, however, by a steady advance, and the August average in New York was 68.745c., or nearly the highest of the year. September showed another slight depression, the average for that month having been 67.792c., or nearly a cent below the preceding month. Since October opened there has been a sharp and decided fall in prices; on Oct. 1 the quotations were 66⅞c. in New York and 30⅞d. in London, while on Oct. 9 they were 65c. and 30d., respectively. From that point the decline was rapid, 60⅜c. and 27⅞d. being reached Oct. 14. November has brought the price down to 58¾c. in New York and 27 3/16d. in London.

As in previous years, the fluctuations in price seem to have been determined largely by the demand from the Far East, and especially from India. China was not an important factor last year, taking little silver after the first quarter; this year it has not only been out of the London market altogether, but has shipped some quantities to Europe—£374,025 in value to London up to Oct. 1—and considerably larger amounts to India direct. This is, in part, a return of the heavy purchases made in London and Australia two years ago, ostensibly for coinage purposes. The Straits Settlements, which were out of the market last year, have taken considerable quantities this year—£925,750 from London up to Oct. 1—chiefly in the form of coined silver for circulation; though this has been largely offset by returns in silver bars amounting to £771,448 for the same period.

India, however, has been the chief factor in the market. That country has had two or three very prosperous years, and has invested its savings chiefly in silver, according to its immemorial custom. During the calendar year 1905, the exports from London, the chief market, to India were valued at £7,596,829; in 1906, this value nearly doubled, being £15,063,927, though the gain in quantities was not quite so large, owing to higher prices. This year, up to Oct. 1, the exports have been £9,451,076, a decrease of about 20 per cent. for the nine months, but still a larger amount than for several preceding years.

In the last few weeks, however, ominous reports have come from India of the failure of the seasonal rains over large areas in the Northwest Provinces and in parts of the south. This means a probable failure of crops, and consequently of buying power. In a large part of the country there will be no savings to invest, and already purchases for Indian account in London have practically ceased. This is the main cause of the recent decline in price; its sharpness was probably accentuated by the closing out of some large speculative accounts, but that was only a temporary feature of the situation. The dependence of the silver market on the East has again been clearly brought out.

It is said that there has been recently a decline in the demand for silver for use in the arts. It is, however, difficult to determine the extent of this; and it is not probable that it has been sufficient to have an important effect on the price. In this country mint buying has not been on a large scale, certainly not enough to lend any support to the market. The present indications point to still lower prices.

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IF OUR CONTEMPORARY, the London *Mining Journal*, will take the trouble to look over our market reports for last spring and also the daily reports of the New York Metal Exchange, it will learn that our recent remarks respecting the latter were a simple statement of fact and did not conflict with a previous editorial in the ENGINEERING AND MINING JOURNAL, or imply any admission whatsoever. If also it will reflect upon the dishonor of attributing to a contemporary, inferentially if not directly, remarks which it did not make, it may perceive that it has been guilty of such an offence against decency. Self-contradictory statements, garbled extracts and false imputations are naturally to be expected in a certain class of periodicals, but in the London *Mining Journal* we look for more care-

# Views, Suggestions and Experiences of Readers

**Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information**

## CORRESPONDENCE AND DISCUSSION

### Negative Results in Pyritic Smelting

I do not agree wholly with Mr. Lang where he says there can be no doubt that Mr. Beardsley has hit upon the correct explanation of the failure of the pyritic process at Sudbury, but rather I should think that Mr. Lang's supplement gives the true explanation.

Mr. Beardsley's troubles have a familiar sound to me and what happened to him under the conditions mentioned, has happened many times and at many places with ordinary pyrite or pyrrhotite. Hence the presence of nickel in the Sudbury ores could hardly have been the cause of his troubles and his statement, "From experience with the nickel left out, it is certain that an ore of this construction would have given no trouble" is, in my opinion, not true. How very familiar, too, is Mr. Beardsley's statement? "Each test was carefully planned before it was begun; all necessary slag and matte-fall calculations were made." We have all done these things only to find that the perverse furnace did exactly as it pleased. Hence, I long ago said that, in pyritic smelting, the furnace chooses its own slag. That is to say, it will only oxidize iron enough to meet the requirements of the remaining slag constituents. Now, in Mr. Beardsley's case, there were no requirements to be met, and but little, if any, oxidation took place, but of this, however, we are not sure, as he did not run his furnace long enough to find out. I certainly should have driven one test to a finish and have learned something, or "froze up." I will try to make my statement plain.

Had the gangue in the ore been silica, I think Mr. Beardsley would have succeeded; but as it was a silicate of alumina and hence, in one sense, was already a satisfied slag, the silica in the ore could hardly make new combinations without breaking up those already formed and for this the heat of a pyritic furnace is probably not great enough; but had the gangue been plain silica it would at a very low heat, have become a powerful acid, capable of combining at once. In other words, pure silica, would have formed combinations which would themselves have given off heat and thus help along the process. Again, even with silica one does not get very good effects until long noses have been formed at the tuyeres. This was nicely illustrated in the JOURNAL some years ago by a Ducktown correspondent. The old time metallurgist, who spent most of his time in building up a nose because it was the life of his furnace, would now be strictly "in it." By the time I began smelting, noses had gone out of fashion, and I was much chagrined to find that my tuyeres were always dark and I spent much time in trying to burn off the noses; but I soon learned that one does not burn much pyrite until they are fully formed, so I conclude that upon these two, silica and long noses, hang, in pyritic smelting, "all the law and the prophets" (certainly all the "profits").

#### RESULTS NOT CONCLUSIVE

It does not follow, however, that some modification of pyritic smelting may not be used at Sudbury. I am quite sure that it can, but I have had my full share of troubles with similar conditions. I once carried on a long series of costly experiments, trying to smelt the Cripple Creek ores, phonolites and granites, with raw Leadville pyrite, and failed. Another long series of experiments with the Mary Murphy ores and raw Leadville pyrite, was also unsuccessful and a third set, which was still longer and more costly, was conducted with Gilpin county gold ores, which are practically altered granites carrying pyrite; these were combined with raw Leadville pyrite. These last experiments were successful metallurgically in many ways, but the process was found unsuitable for competition with the lead smelters for the extraction of gold and silver. From the experience gained here, I now think I could succeed with either the Cripple Creek or Mary Murphy ores, so far as slagging is concerned, but I know that the loss of gold would prevent competition with lead smelters, unless I could secure supplies of copper not now available in Colorado. Very few of these questions should arise at Sudbury, although there may be others which one does not foresee, and only a long series of costly experiments could determine the matter.

It is by just such papers as Mr. Beardsley's that we acquire information. We are all ready enough to record our successes, but few of us like to record failures; but after all, it is sometimes just as necessary to show that there is no thoroughfare, as to show that there is one. Mr. Beardsley is to be complimented for his valuable paper.

FRANKLIN R. CARPENTER.

Denver, Colo., Oct. 10, 1907.

### Steel Cylinders for Liquid Chlorine

Information is desired as to manufacturers, in the United States, of steel cylinders to be used in storing, handling and transporting liquid chlorine.

H. G. ELY.

New York, Oct. 18, 1907.

The Pressed Steel Tank Company of Milwaukee, Wis., makes seamless steel tanks, shells and cylinders adapted to hold gas, oil, fluids, chemicals, etc., under pressure. It also makes reservoirs suitable for storing larger quantities of these substances than it is convenient to transport. The tanks vary from 5 to 20 in. in internal diameter and can be obtained in lengths from 1 to 5 ft. The cylinders are made to stand a hydraulic pressure test of 150 to 1200 lb. per sq. in. according to the requirements of the purchaser.

### The Larder Lake District

The daily papers have from time to time published glowing accounts of the progress of development work at Larder Lake. In view of the charges made in the trial of the case against Law & Co., mining brokers, of Toronto, in connection with the flotation of the stock of the Highland Mary Company, a visit was recently paid to the camp by a mineralogical expert who gives the following account of actual conditions:

"Reaching Larder City on Oct. 31, I found that all work had been suspended on the Blue Bell and Lucky Boy properties. The Blue Bell shaft at Spoons Bay was full of water. At the Harris-Maxwell property the company was going on with the frame of a 10-stamp mill. At about 120 ft. down, near the water level, work was being started with hand steel on an exploratory tunnel to crosscut the dike. They intend to ship machinery after the snow flies. The dike material is probably a replacement by quartz of what has originally been dolomitic matrix. On casual inspection a hand specimen looked like quartzite, but examination under a glass showed a distinct crystalline structure and there was a slight effervescence on the application of acid. There is a small amount of galena and iron pyrite in the dike matter and occasional sights of free gold. The work has been conducted economically and honestly.

"The Highland Mary, the much advertised property consists of 30 claims on the east side of the North East bay. These claims are now being surveyed. No mining work has been done on them. No member of the company has ever visited them, so far as could be ascertained. Fifteen have no outcrop and on the other 15 nothing of any value has been found. The promoters announced publicly that valuable discoveries had been made on each.

"The Larder Lake Proprietary Gold Fields Company has suspended operations. Seven or eight men who had worked for the company were met on the trail from Larder Lake. They had not been paid for three months, and had not enough money to pay for meals on the way out.

"The trail from Tomstown, three miles from Heaslip on the railway, passing through Wendigo to Fitzpatrick's bay, is not bad when frozen, but soft weather makes it almost impassable. The trail from Boston direct to Larder City is in very bad condition." I. O.

Toronto, Ont., Nov. 11, 1907.

## Current and Capacity in Electrolytic Copper Refining

I have been greatly interested in the articles in the JOURNAL, and in the last volume of "The Mineral Industry," on electrolytic copper refining. I find many valuable details and statements, but I regret that I am not yet able to complete one calculation referring to the output of copper per vat and day.

In "The Mineral Industry," p. 295, the author says that the theoretical amount of copper deposits per ampere per day is almost exactly an avoirdupois ounce. Would the maximum output of 500 vats with a current of 1000 amp. in 24 hours amount to 12,000,000 ounces?

Further, will you kindly inform me if the multiple works in the United States are everywhere using the arrangement known in Europe as the Siemens electrical connection? Do the bars carrying the current to the vats run continuously along all the vats, the anodes insulated on one side and the cathodes insulated on the other side?

New York, Oct. 9, 1907. W. A. D.

The first question is simple arithmetic. It is approximately correct that, with 100 per cent. efficiency, an ampere day between two electrodes will deposit an avoirdupois ounce. At 1000 amp. we should have 1000 oz. and with 500 vats in series we should have 500,000 oz. in 24 hours.

Regarding the electrical connections in the various multiple works, diagrams of those in use in the old Raritan Copper Works, which is a duplicate of that in use at the Great Falls plant, will be found in "The Mineral Industry," Vol. IX. A photograph of those in use at Chrome, N. J., which is similar to that in the Perth Amboy plant of the American Smelting and Refining Company and the new Raritan plant, is given in Vol. XV. These are two typical arrangements. These and others are illustrated in Titus Ulke's "Modern Electrolytic Copper Refining."

The inquiries suggest that our correspondent may wish to find the output per kilowatt hour. That, of course, depends on a number of factors.

## Size of a Load of Blue Ground

Will you please give in the JOURNAL the cubic measure or weight of a load of blue ground as used in reporting the output of the South African diamond mines

F. A. CHESTER.

Bluefields, Nicaragua, Oct. 4, 1907.

The load when used in this manner as a unit is 16 cu.ft., and according to the De Beers reports averages about 1600 lb. weight.

## American Mining Congress

The tenth annual session of the American Mining Congress began on Monday, Nov. 11, in Joplin, Mo. The following is a summary of the official program:

*Monday*—Automobile excursion from the auditorium to Chitwood, Belleville, Carl Junction, Badger, Galena and Baxter Springs. Opening session in the evening, including addresses by Governor Joseph W. Folk, Mayor Osborn, of Joplin, and Col. H. H. Gregg.

*Tuesday*—Report of the committee on a uniform law governing metalliferous mining and quarrying in the various States, by W. R. Ingalls, chairman, New York. Papers on "Prospecting for Gas and Petroleum," by Dr. Erasmus Haworth, State University, Lawrence, Kan.; "Lead and Zinc Mining in Missouri, Kansas, Oklahoma and Arkansas," by Dr. E. R. Buckley, Rolla, Mo.; "Tariff on Zinc Ores," by S. Duffield Mitchell, Carthage, Mo.; "The Waste of the Nation's Mineral Resources," by Dr. J. A. Holmes, Washington, D. C. Address of President J. H. Richards.

*Wednesday*—Report of the committee appointed to investigate the question of "Smelter Rates," by Judge E. A. Colburn, chairman, Denver, Colo. Report of the committee appointed to draft a sideline law to be presented to the Federal Congress, by James D. Hague, chairman, New York. Reading of papers on: "Will the Production of Gold in the World Keep Pace with the Increasing Demands of Commerce and Trade?" by Dr. Waldemar Lindgren, Washington, D. C.; "Deflocculated Graphite," by E. G. Acheson, Niagara Falls, N. Y.; "How Long Will the Supply of Coal Meet the Increasing Demands of Commerce and Trade?" by E. W. Parker, Washington, D. C.

*Thursday*—Report of the committee to investigate into the corporation laws of the various States, with a view to suggesting additional protection for mining investors, by C. J. Downey, chairman, Denver, Colo. Reading of papers on: "Gypsum Rock; its Uses and Manufacture into Calcined Plaster," by C. O. Bartlett, Cleveland, Ohio; "The International Mining Exposition, Madison Square Garden, N. Y.," by W. M. Porter, New York; "State Mining Associations and the American Mining Congress," by Ex-Governor A. W. McIntire, Everett, Wash.; "A Remedy for the Law of the Apex," by Dr. James Douglas, New York. Symposium on mining engineering education: "The Scope and Present Status of Mining Engineering Education in the United States," by Dr. Victor C. Alderson, president Colorado School of Mines, Golden, Colo.; "What the Profession Can Reasonably Expect from the Mining School Graduates," by Dr. Milnor Roberts, Washington School of Mines, Seattle, Wash.; "The Relation of the Mining School to the Mining Industry," by Prof. Robert H. Richards, Boston, Mass.; "Secondary Technical Education Applied to Mining," by Lewis Young, director Missouri School of Mines, Rolla, Mo.; "The Value of Correspondence Instruction to the Mining Man," by H. H. Stoek, editor of *Mines and Minerals*, Scranton, Penn.; "What Should Be the Relative Time Given to Theoretical Study, Laboratory Practice and Actual Mining Experience in the Education of the Mining Engineer?" by Prof. Robert Peele, School of Mines, Columbia University, New York City. Address: "The Relation of the United States Geological Survey to the Mining Industry," by Dr. George Otis Smith, director United States Geological Survey, Washington, D. C.; "A Federal Department of Mines and Mining," by John Hays Hammond, New York.

*Friday*—Address: "The History of Gold and Silver," by James W. Malcolmson, Kansas City, Mo.; "The Man Who Stakes Claims Everywhere—Does he Assist or Retard the Development of the Mining Industry?" by Randall H. Kemp, editor *Northwest Mining News*, Spokane, Wash. Report of committee appointed to investigate the advisability of a commission, appointed from the several coal-mining States and the United States at large, to investigate the conditions affecting safety in coal mining with a view toward the formulation and enforcement of adequate laws governing this branch of the mining industry, by Dr. H. Foster Bain, State geologist, Urbana, Ill.; "The Importance of the Mining Industry to the Industrial and Commercial Life of a Nation," by H. J. Cantwell, St. Louis.

*Saturday*—Excursion by trolley to various camps in the district.

## Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

John Hays Hammond has gone to California.

Quincy A. Shaw, of Boston, is visiting the Lake Superior region.

Robert J. Coleman, of Los Angeles, Cal., is examining mines in Sinaloa, Mexico.

Herbert C. Hoover, of Bewick, Moreing & Co., London, England, is in Burma.

President Alexander Agassiz, of the Calumet & Hecla Company, is at the mine, on his regular inspection trip.

F. W. Denton, superintendent of the Copper Range mines in the Lake Superior region, is visiting Boston on business.

O. B. Perry, general manager for the Guggenheim companies operating in Yukon Territory, has returned to New York from the North.

Hermann A. Keller, consulting mining engineer, of New York, has returned from Alaska, where he has recently been engaged on professional business.

Alfred James, consulting mining engineer, of London, England, arrived at New York, Nov. 2, en route for Mexico, whither he proceeded, Nov. 9. He will return in December.

John Power Hutchins, consulting mining engineer, of New York, has gone to Oregon to examine placer mining property. He will probably be absent until early in December.

Chas. H. Munro, mining engineer, of San Francisco, who has been engaged in placer mining and gold dredging in California, is going to Colombia, where he will engage in placer mining.

Wm. Fleet Robertson, provincial mineralogist for British Columbia, has returned to Victoria from an official visit to Queen Charlotte islands and other parts on the coast of British Columbia.

Thos. R. Stockett, of Nanaimo, B. C., general manager for the Western Fuel Company, of San Francisco, Cal., with collieries on Vancouver island, B. C., was in Seattle, Wash., at the end of October.

Thomas Kiddie has been appointed manager of the Northport Smelting and Refining Company's smelting works at Northport, Wash., in succession to Albert I. Goodell, who has resigned to return to Colorado.

F. Yamada, an engineer connected with the Furukawa Mining Company's Ashio mine, Shimotsuke, Japan, has been visiting mines and smelting works in British Columbia and studying mining methods and metallurgical practice.

Philip R. Bradley, mining engineer, who is operating placer mines in British Guiana, was a recent visitor in New York. He is making a trip to the West, on business and pleasure, from which he will not return for several months.

T. W. Gibson, deputy minister of mines for Ontario, Prof. W. G. Miller, provincial mineralogist, and E. T. Corkill, mining inspector, lately inspected a new smelting plant at Deloro, Hastings county, Ontario. This plant, which will treat 15 to 20 tons of Cobalt ore a day, is nearly completed.

## Obituary

John Blue, who has been for the past 27 years superintendent of the mines and connected works now operated by the Eustis Mining Company, at Capelton, P. Q., was killed Nov. 2 by being run over by a full water car in the main shaft. He was born at the Mearns, Glasgow, Scotland. After serving an apprenticeship in civil engineering with Robertson & Co., of that city, he began his professional experience as a surveyor in Scotch coal mines. In 1865 he came to America. He was employed first in construction work on the Grand Trunk railway, and later executed several contracts on the Canadian Pacific and the Quebec Central railways. In the construction of the Hoosac tunnel he acted as assistant under Walter Shanly, and upon the death of the latter became superintendent, and was in charge of the construction of the east end of the tunnel until its completion. He also superintended the construction of the Lachine canal near Montreal. Since 1880 he has been mining superintendent at Capelton, Que., first for the Orford Nickel and Copper Company, and later for the Eustis Mining Company, of which he was a director. He was a councillor of the Canadian Mining Institute, and a member of the American Institute of Mining Engineers. He stood high among Canadian mining engineers, his advice being frequently sought by younger men. His death will be widely regretted.

## Societies and Technical Schools

*Field Museum of Natural History*—This is now the official name of the institution formerly known as the Field Columbian Museum, of Chicago.

*Pennsylvania State College*—A party of students from the School of Mines and Metallurgy is making a trip of two weeks in Pennsylvania, New Jersey and New York, under charge of Prof. Clarence D. Linville. They will visit steel works, cement works, smelting works and copper-refining plants and coke works.

*American Museum of Safety Devices*—The international jury in the section of social economy at the International Book, Paper and Publicity Exposition which closed in Paris last month, has made an award of grand prize to the American Museum of Safety Devices and Industrial Hygiene, of New York. A diploma of honor, the second highest award, was made to Charles Kirchhoff and T. C. Martin, respectively chairman and vice-chairman of the museum's advisory council, and also to Dr. L. L. Seaman and Rudolph Lenz.

## Industrial

H. Vincent Wallace, H. Gordon Glore and Maurice W. Summerhayes have formed a partnership under the name of Wallace, Glore & Summerhayes, to undertake engineering work of any kind pertaining to mining and metallurgy. Their office is at Nogales, Arizona.

The Joshua Hendy Iron Works, San Francisco, Cal., have recently completed and shipped two "Anaconda" timber-framing machines, one for the United Verde Copper Company at Jerome, Arizona, and one for the Red Metal Mining Company at Butte, Mont. A third machine, for the Anaconda Copper Company at Butte, is nearly completed.

## Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Ingersoll-Rand Company, 11 Broadway, New York. Diamondless Core Drills. Pp. 18, illustrated, paper, 3¼x5½ in.; March, 1907.

Brown & Sharpe Manufacturing Company, Providence, R. I. Catalog No. 109. Price Lists of Machinists' Tools. Pp. 183, indexed, illustrated, paper, 5½x8 inches.

## Construction News

*Avoca, Pennsylvania*—The Hillside Coal and Iron Company is about to build a new breaker for the Consolidated colliery. The company is controlled by the Erie Railroad Company.

*Duluth, Minnesota*—The Pittsburg Coal Company is about to build a very large coal dock and storage plant at Duluth. The probable cost is $1,000,000. The company's offices are at Pittsburg.

*Black Rock, Arkansas*—The Powhatan Zinc and Lead Mining Company is considering the question of putting up a concentrating mill. B. J. Campbell, Memphis, Tenn., is secretary and treasurer.

*Calamine, Arkansas*—The Arbuckle Mining and Milling Company is arranging to put up a 200-ton concentrating mill for zinc ores; also an electric plant to be operated by water power. E. S. Merkle, Imboden, Ark., is engineer in charge.

*Sandon, British Columbia*—An aërial tramway, 5000 ft. in length, is being constructed from the Eureka-Richmond mine to the Canadian Pacific depot at Sandon. The mine is owned by the Consolidated Mining and Smelting Company of Canada, Ltd.

# Special Correspondence from Mining Centers

**News of the Industry Reported by Special Representatives at Denver, Salt Lake City, San Francisco and London**

## REVIEWS OF IMPORTANT EVENTS

### San Francisco

*Nov.* 6—Some of the supervisors of the valley counties who are members of Anti Debris Association are again becoming restive about the dredging question on the Feather river, and are denouncing the whole dredging industry. It is thought that certain of the Butte county supervisors intend entering their county in the list to help the Anti-Debris fund with a monthly contribution. At the last meeting of the Anti-Debris Association a report was received from a man employed to examine the territory and report on the method used by the dredging companies to landlock the machines. The association has a committee on dredge mining, and the matter was referred to it with power to act; and unless the land-locking is completed in accordance with the plans of the association, the committee will authorize the attorneys to bring such suits as might be necessary for the purpose of accomplishing this result.

The Bay Counties Power Company no longer has a monopoly of the electric power supply to the dredging companies. The Oro Water, Light and Power Company has an electric plant 14 miles above Oroville and supplies power for half a dozen dredges of its own and to some others as well. The dredges pay about $40 per day for their electric power, depending on their size, and better service is being demanded than is at present given. A large power plant is being built at Big Bend by the Great Western Power Company and it will, before long, be in a position to furnish power to Oroville and Marysville dredging fields.

The three appraisers appointed by the District Court of the United States for the northern district of California to ascertain the value of the property of the Dutch Mining and Milling Company, a bankrupt corporation with mines near Quartz mountain, Tuolume county, have reported that the lands, mill-sites and mines of the company are worth $26,500. Adding the machinery, supplies and buildings, the total property is appraised at $39,660.

The last rail in the Tonopah & Tidewater railroad from Los Angeles was laid at Gold Center, Nev., on Oct. 30. This completes the direct line into Beatty and Rhyolite, Nev., and affords direct connections with Tonopah and Goldfield. It is announced that regular freight service will be inaugurated on Nov. 25 and that passenger service will begin December 1 next.

The proposition which originated at Greenwater, Inyo county, to organize a State Federation or Union of Miners, apparently fizzled out before it was given any consideration at all. A convention to form the organization was called to be held at Grass Valley, Nov. 4, but only four delegates appeared, two of whom were opposed to the plan. The delegate from Greenwater did not show up. In fact, as a month ago the Grass Valley Miners' Union voted against the formation of a State union, the matter was virtually killed, as that is one of the strongest unions in the West, and the convention was to be held at its home town.

At Thermalito landing, a mile and a half from Oroville, preparations are being made to build dredge No. 8 for the interests controlled by W. P. Hammon. The new dredge will be a large one, equipped with the latest and heaviest dredging machinery.

The Standard Portland Cement Company, at Napa Junction, being unable to obtain cars to haul away the product, and having its bins and warehouses filled, has been compelled to close down for a time and about 1000 men are out of work as a result. It has been decided by the company to build an electric tramway to Napa creek, which is a tidewater stream; haul the cement there and ship it to San Francisco on barges.

The old Blue Point hydraulic mine at Smartsville, formerly owned by "Paddy" Campbell, who distinguished himself by his vigorous fight against the Anti-Debris Association years ago, is about to be started up by the Tarr Mining Company, of which E. W. Tarr is manager. Lumber is being hauled in to repair the tunnels and flume. The channel of this mine is known to be rich, as it yielded well when worked by hydraulic process. Another system is now to be tried, as they cannot impound the debris satisfactorily, and no work has, therefore, been done for years.

### Salt Lake City

*Nov.* 8—The smelter of the Bingham Consolidated Mining and Smelting Company is to be placed out of commission and, in all probability, dismantled, in the near future. No more ore will be accepted from mines outside the company's possessions. The plant will be operated until the ores accumulated about the smelter are cleaned up. The Bingham smelter was the first custom plant built in the Salt Lake valley at which custom copper ores were accepted for treatment. While the shutting down has not been unexpected, it was believed the event would not occur until the proposed new smelter of the Miners' Smelting Company, a Heinze project, is built on the site selected for it on the south end of the Great Salt lake.

The American Smelting and Refining Company, the United States Smelting, Refining and Mining Company are refusing to accept ore for treatment at their Salt Lake valley smelters, except that contracted for. As a result of this situation producers that have gone into the open market heretofore are shut out for the time being. An example of this is the Horn silver mine at Frisco, and a dividend payer. The Grand Central mine is left in the same position since notice of the suspension of the Bingham Consolidated smelter was given.

Dividends have been posted by three Tintic mining companies during the past week, the contributing mines and amounts being: Mammoth, $20,000; May Day, $12,000; Uncle Sam Consolidated, $15,000.

What is the probable end of seven years of tedious and expensive litigation came a few days ago in the district court in the shape of a judgment for $91,349, with interest at the rate of 8 per cent. per annum and amounting to $58,463, making a total of $149,812, in favor of the Grand Central Mining Company. The Mammoth Mining Company was the defendant and was sued for $300,000, or the valuation of ore extracted from the Silveropolis lode mining claim, which it claimed by reason of apex rights. The trial of this case witnessed one of the most stubbornly fought legal battles ever waged in a Utah court.

The Park City Miners' Union has voluntarily declared the strike at the Daly West, Daly and Ontario mines off, without accomplishing the object for which it was called. The trouble originated about six weeks ago when the management discharged a shift-boss for sufficient reasons. The union demanded a reinstatement of the employee dismissed as well as union recognition, which was refused. The strike was called and the mines were shut down. It is likely that a resumption of operations will occur in a few days; but not upon as extensive basis as formerly —not, at least, until the metal market situation settles down somewhat.

### Butte

*Nov.* 8—There has been a further curtailment of production by the Butte Coali-

tion Company, but aside from that there has been no material change in the copper-mining situation in Butte in a month. The Coalition company had been mining about 500 tons of ore per day from the Rarus mine, to which property mining operations have been confined since the policy of curtailment went into effect. It is claimed that the company produced more than its quota under the retrenchment agreement, and it was therefore required to make a further curtailment; now it is mining less than 300 tons per day, as against 1600 tons a few months ago. The Coalition and Amalgamated officials in the East have favored a complete suspension, but they were dissuaded from that step by local conditions in Butte, earnestly represented by the Butte officials of the companies.

The depression in the copper and money markets has had its effect on the Butte labor situation. The discharge of 5000 or 6000 men in the district has had the effect of taking off the keen edge of the discontent and arbitrariness of labor, which has threatened the peace of Butte for several years. The disturbers are going to other fields, and men that remain are of more substantial character. When the Amalgamated and other companies notified the unions that a reduction of wages to the basis in force last year would be put into effect Nov. 1, there was practically no opposition, and the Miners' Union promptly took a vote on the question, and decided to abide by the terms of the contracts entered into with the mining companies eight months ago. By these they were granted $4 a day with the proviso that there should be a return to the $3.50 per day wage, should copper prices fall below 18 cents again. The price has been below that mark more than two months, but the companies continued to pay the increased wages until Nov. 1. The Butte Miners' Union is composed of conservative men and their relations with the mining companies have always been harmonious. There are other labor unions in Butte, however, that have kept the city and mining district in constant strife and turmoil for years.

While the big mining companies have been curtailing their output, some of the new developing companies have been compelled to suspend operations entirely. The Butte & Bacorn Company, backed by Pittsburg capitalists, is the latest to stop work. The company is developing some ground in the far north section of the Butte district, and there has been a great deal of interest in its work, as success meant the opening of a practically new copper district. The Butte & Bacorn people have great wealth back of them, but they have been unable to get the ready cash for continuing operations in Butte.

Aside from the suspension of the State Savings Bank in Butte, the banks here have experienced no trouble, and there have been no unusual withdrawals. Efforts are being made to re-open the State Savings bank, but when it does resume business it is probable that F. Augustus Heinze will be out of it. Several applications for the appointment of receivers are pending in the district court, but the heavy depositors are petitioning against this, expressing confidence in the bank and its present managers.

## Toronto

*Nov.* 9—The special committee of the Canadian Mining Institute, appointed to consider amendments to the provincial mining laws, met in Toronto on Oct. 31. The silver, iron, nickel and copper interests were represented. The principal question taken up was the mining tax of three per cent. on the gross earnings of all mines producing $10,000 or more annually. It was urged that this provision tends to favor wild-cat schemes as opposed to legitimate mining enterprises, and a memorial was prepared, for presentation to the Government, asking that the law be amended so as to make all mines subject to the tax.

Action has recently been taken by the Nipissing Mining Company to dispossess a large number of squatters, who have settled on the company's property. As the Nipissing possesses both surface and mineral rights, covering a large part of the northern section of Cobalt, many of the citizens who have put up stores and residences have been notified to vacate or pay rent. A deputation comprising several of those included in the proceedings were in Toronto and waited on Hon. Frank Cochrane, minister of mines, with a view to settling the difficulty by arbitration. They claim to have acquired squatters' rights by having been allowed to remain on the property undisturbed until the present.

## London

*Nov.* 2—A week or two ago I mentioned that there was some prospect of a society of Rhodesian shareholders being formed in London with a view of pressing the much needed reforms in Rhodesian administration. That the Chartered Company recognizes that something must be done in order to improve the prospects of the country, is to be seen from the fact that the directors have already published a preliminary report of their intentions. Not only shareholders, but the settlers in Rhodesia are discontented with their position and it is not too much to say that the Chartered Company feels that it is a failure as a colonizer. The statement issued by the directors announces some modifications in the method of treating settlers, but the concessions amount to very little, and it is doubtful if they will be accepted as final.

It is not necessary to go into details of administration and government here and I will refer only to the new mining regulations. These are full of red tape and details, such as gladden the heart of a lawyer or an accountant, but are a pest to the frontiersman and settler. For instance the directors' statement says that "on and after Jan. 1, 1908, mining locations producing gold are to be free from Clauses 40, 41 and 42 of the 1903 Ordinance or subsequent amendments. Where the gross value of the monthly output does not exceed £100 no royalty is payable and claim licenses are to be reduced 50 per cent. In all other cases a royalty of 5 per cent. on the gross value of the output is to be paid to the British South Africa Company, subject to the following adjustments: In order to give some elasticity and to meet the case of exceptionally low-grade propositions and also very rich finds where the gross value of the monthly output does not exceed £3000 a royalty of 2½ per cent. is to be paid to the British South Africa Company; properties crushing not less than 5000 tons per month and recovering not more than 22s. per ton are to be charged with and pay to the British South Africa Company a royalty of 3½ per cent. of the gross value of the output; properties crushing not less than 10,000 tons per month and recovering a not greater value than 16s. per ton are to be charged with and pay to the British South Africa Company a royalty of 2½ per cent. of the gross value of the output. In the exceptional cases where the value of the ore exceeds 1 oz. a surcharge will be made of 2½ per cent., bringing the total royalty payable up to 7½ per cent. of the gross value of the output. In order to prevent the locking up of large numbers of undeveloped claims and to encourage the progress of mining throughout the country, the use of certificates of extra work will be confined to blocks of claims contiguous to the block or blocks on which the work for which the certificate has been given has been executed. Inspection by payment will only be permitted for two years, calculated from the date of posting the discovery notice. The fees payable will be £5 on the first inspection, six months after posting, and £15 twelve months after posting. During the second twelve months, to secure a third inspection, 60 ft. of work must be done or the claims be forfeited. All subsequent inspections must be obtained by work. With regard to claims located before Dec. 31, 1907, these new provisions respecting inspections by payment and the use of certificates of extra work will become operative on and after Jan. 1, 1911. Legislation will be introduced at an early date to give effect to the above provisions." These regulations are no doubt all very well in their way, but are quite unsuitable to the untrammeled development of the country. They are far too much like the oppressive military rule adopted by the German colonial office. The west of America was not opened up by this kind of government.

# Mining News from All Parts of the World

**New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents**

## THE CURRENT HISTORY OF MINING

### General Mining News

*Tennessee Coal, Iron and Railroad Company*—As briefly announced last week, the United States Steel Corporation has purchased a majority of the stock of this company. The total stock issued is $33,067,900 common and $248,300 preferred. The Steel Corporation has also offered to purchase any of the remaining common shares which may be deposited at the office of J. P. Morgan & Co. on or before Nov. 21, allowing therefor the same terms as given the majority interest, namely United States Steel Corporation sinking fund 5 per cent. bonds, dated 1903, at 84, for Tennessee stock at par—in other words, an exchange will be made on the basis of $11,094.76+, face value, in the bonds for $10,000 par value of the stock. On Nov. 8 J. P. Morgan & Co. had received about $25,000,000 of stock for exchange. The New York Stock Exchange has authorized the listing of $30,000,000 of the 5 per cent. sinking fund bonds of the Steel Corporation to be issued to take up the stock deposited; their distribution will make outstanding $200,000,000 of the authorized issue of $250,000,000 of these bonds.

While the executive committee of the Republic Iron and Steel Company is identical with that of the Tennessee company, the former company is not, it is stated, affected by the transfer that has taken place. Its stock, though controlled by members of its directorate, is widely held, in contrast with that of the Tennessee, in which there have been exceedingly few transactions in the past 22 months.

### Alaska

SEWARD PENINSULA

*Pioneer Mining Company*—This company has purchased a controlling interest in the Nome-Chinook Mining Company, with about 700 acres of gold-bearing ground in and about Nome; a controlling interest in the gold properties of the Connelly Quartz Mining Company and has acquired a number of other claims immediately adjacent to Nome. Claims absorbed by the purchase of the Nome-Chinook Mining Company are located on both sides of the Snake river, in and near Nome. Gold deposits have been found, by development work, at a depth of 20 ft. below sea level, or 45 ft. below the surface of the ground. Operations on the Nome-Chinook property will have to be conducted by drifting on bedrock. The company's holdings extend clear down to the shore, but the ground is frozen and no danger of seepage or interference by water is feared.

### Arizona

BISBEE DISTRICT

Wages at Bisbee have been cut to $3.50 per day. The reduction took effect on Nov. 11, and is due to the same causes that led to lower pay for miners in other copper camps.

*Shattuck Mining Company*—The company has nearly shut off production temporarily. It has no smelter and the refusal of the Copper Queen to longer treat custom ores reduced its output, a month ago, from 400 tons a day to half that quantity. The remainder it was shipping to Globe, which now can take no more than 100 tons a day, for an indefinite period. There is no other market for the ores. The Denn, an associated property, is not mining any tonnage, but is continuing its development work, and will inaugurate diamond drilling from deep levels.

*Mazatzal Copper Company*—The company which is opening a mine on the lower Verde river country, about midway between Jerome and Roosevelt, has cut high-grade sulphides in a tunnel 1200 ft. below the outcroppings. The district is a new one, and was examined last year by engineers, who found wide and strong ledges carrying excellent copper indications, iron and lime, with the same schistose diorites that are seen at Jerome. The region is difficult of access, being about 80 miles northwest from Globe, which is the best point of ingress.

GRAHAM COUNTY

*Detroit Copper Mining Company*—On Nov. 1 this company made a heavy cut in the wages of its employees. Of the 1600 employees more than 400 have quit work and many more are expected to quit in a few days. The smelter has been shut down and it is not known when it will resume.

*Arizona Copper Company*—This company made a general cut in wages and has discharged many of its employees. Concentrator No. 5 was shut down Nov. 1 and will not be started again. The situation is a serious one; many men are idle and the copper-mining business in the Southwest is paralyzed generally.

### California

AMADOR COUNTY

*Bunker Hill Mining Company*—A new air compressor is being installed as well as a new hoist. The tenth dividend of 10c. per share has been declared. The ore crushed last month averaged $4 per ton.

BUTTE COUNTY

*Butterfly*—In this gravel mine at Morris Ravine, above Oroville, a rich strike has been made in new ground.

CALAVERAS COUNTY

*North Star Mining Company*—In this drift mine, Mokelumne hill, L. Everett, superintendent, active work of reducing and washing the gravel has begun. The company owns 3½ miles in the channel which averages 300 ft. in width with about 10 ft. of pay gravel.

KERN COUNTY

*Atolia Mining Company*—This company of San Francisco, which owns the Randsburg tungsten mines, and which has in the past been one of the largest American producers of tungsten ores, has closed down its mines indefinitely.

*Red Rock*—Work has been renewed in the dry washing camp of Red Rock, in the Mohave desert. A. D. Myers and John Singleton have bought and are working the Cottontail claim.

MONO COUNTY

*Coleville*—The old claim of the Golden Gate Mining Company at this place has been purchased by Frank Enzensperger, who is developing the ground, and is to erect a new mill to take the place of the one destroyed by a snowslide.

NAPA COUNTY

*Aetna*—A New York company, with offices at 132 Nassau street, has taken an option on this quicksilver mine and will make many improvements.

NEVADA COUNTY

*Greenhorn*—Work has been resumed with prospecting drills in this creek, in the interests of a dredging company.

*Austin*—Work has commenced in the erection of a five-stamp mill on this mine at Willow valley, Nevada City district. A large pump has been installed.

*Galena*—A. D. McMillan and others have taken up a ledge of galena near Bowman's dam. The claim was worked many years ago.

*Grey Eagle*—A hoisting plant is in course of construction at this mine near Maybert and new concentrators are to be placed in the ten-stamp mill.

*Yuba*—At this mine, Maybert, the East vein lost many years ago has been re-discovered within 40 ft. of the drain tunnel. In two months the 20-stamp mill of the mine will be running regularly.

PLACER COUNTY

*Spring Garden*—This gravel mine formerly owned by S. R. Bradley, and H. W. and J. F. Nash has become the property of W. T. Farrar, of Alameda, who will start work on a tunnel and install the necessary machinery within 60 days.

RIVERSIDE COUNTY

*Whipple Mountain Gold and Copper Company*—This company has purchased a new gasolene hoist, cable, etc., and is sinking on the Blue Bird claims, the intention being to go to the 500 level.

*Beryl*—A deposit of this gem has been found near the town of Riverside. C. O. Johnson and F. Pfoff are the discoverers and H. A. Johnson now holds an option on the property.

SAN BERNARDINO COUNTY

*Avawatz*—This place, formerly Dry Camp, is now the center of Crackerjack district, and a regular mail and supply service is in operation to Silver Lake on the Salt Lake railroad line. The Beehive group of five claims in the Death Valley slope of the Avawatz mountains has been sold by F. C. Faxon to H. H. Wallace and associates, of Los Angeles.

SHASTA COUNTY

*Golinsky Group*—The Guggenheim Bros. are about shipping 1000 tons of ore from the group of mines three miles west of Kennett.

SISKIYOU COUNTY

*Blue Ledge*—This copper mine has not been closed down as reported; 100 men are still at work.

*Mammoth Copper Company*—This company of Kennett has secured a bond and lease on the Wood & Sheldon copper property at Rainbow at the headwaters of the Sacramento valley, and men have been set at work on the tunnel.

*Highland*—In this mine on China Gulch exceptionally rich ore has been found in an upraise from the lower crosscut tunnel.

YUBA COUNTY

*Blue Point*—The Tarr Mining Company is preparing to rehabilitate this old gravel mine at Smartsville, formerly owned by "Paddy" Campbell.

## Colorado

LAKE COUNTY—LEADVILLE

The tonnage of all classes of ore for October was 72,000 tons, a slight falling off from previous months. This can be partly attributed to the drop in the price of metals, especially copper. The Arkansas Valley smelter handled 60,000 tons of the output. The "flurry" in the money centers has not affected Leadville, as so far not a man has been let out from any mine.

*Mammoth*—The drift from the south being driven to the shaft in Big Evans gulch is now in over 60 ft., and the ore still in sight; the average width of the pay ore runs from 2 to 5 ft. At the east side of the property in the lower drift a prospect drift has been driven into the lime, opening a vein of ore about 2 ft. wide that runs well in silver and lead. The volume of water has decreased materially; the pumps are lifting only 326 gal. per minute.

*Swisher Tunnel*—This tunnel, Sugar Loaf district, is being driven from the north end of the hill and is now in over 1000 ft., and has cut the Swisher vein which is over 4 ft. wide. Several shipments of ore have been made. The owners are putting in an air compressor. The Dinero tunnel is in 1300 ft., with still 1700 ft. to go before the Dinero veins are caught.

*Long & Derry*—Ore was opened in the shaft a few days ago, but sufficient work has not been done to demonstrate its extent.

*Fanny Rawlins*—A good body of ore has been opened in one of the lower levels of Breece hill. It proves to be 8 ft. wide. A new electric pump has been installed.

SAN MIGUEL COUNTY

*Consolidated Mines Selection Company*—Last May this company purchased the Japan-Flora group in Savage basin, the Valley View group in Marshall basin, and the Ajax group on Ajax mountain, all within one-half mile of each other, from the Japan-Flora mines company. The Consolidated is an English corporation. Since the purchase, development has been prosecuted on the Japan-Flora group and the Ajax group, an air-compressor plant having been recently installed on the latter. A large concentrating mill has been planned for construction at Pandora, two miles above Telluride, and a wire-rope tramway from there to the Japan-Flora group, with branch tram lines to the Ajax and Valley View. The ore in the Japan-Flora and Ajax groups carries gold, silver and lead, while that of the Valley View carries gold almost exclusively.

*Iona Gold Mining Company*—This company, organized in the early summer, is a subsidiary of the Mines Finance Company, of New York. The latter corporation purchased the Columbia-Menona group, the Champion and Chiefton, N. W. H., Jr., Pay Rock group, and the Alaska placer, all in Savage basin, five miles east of Telluride, early last spring, and shortly thereafter transferred the property to the Iona company. The Columbia-Menona group lies parallel and south of the Tomboy. On either end of the Argentine vein, owned by the Tomboy Gold Mines Company, are located the N. W. H., Jr., and Champion. The Pay Rock group is situated just east of and adjoining the Argentine vein. Recently the Iona company installed a large air-compressor plant, to prosecute development with machine drills. The underground workings in the Columbia-Menona will be extended eastward to intersect the Argentine vein at depth in Champion and Chiefton ground. On the Columbia-Menona group is a 30-stamp mill. W. G. Anderson, of Telluride, is resident manager, and J. B. Farish, of New York, the general manager of the company.

TELLER COUNTY—CRIPPLE CREEK

*El Paso Consolidated*—Engineers will soon begin blocking out the workings above the 600 or present tunnel level. This property is to be leased in blocks about the first of the year. It has been closed down for some time awaiting completion of the drainage tunnel. No ground will be leased below the present water level.

*Golden Cycle Mill*—The mill is being rebuilt and it is expected that before long the company will be buying ore. A number of men have returned to the district and are looking for leases. The recommendation card system in vogue with regard to miners in the district is being pretty generally enforced and the labor situation is generally satisfactory.

*Gold Sovereign*—Work has been resumed on the property both by lessees and company account. A fair amount of ore is being taken out. The property is situated on Bull hill, not far from the John A. Logan.

*Pharmacist Consolidated*—The annual report of this company shows that considerable development work has been done during the past year. The shaft has been sunk from the 650- to 900-ft. level and a large amount of drifting has been done on the latter level. While no ore has been found, a number of promising veins, which are known to have ore in other properties, have been cut. Other lessees are at work on the upper levels of the property and some ore is shipped. The property is situated on Bull hill.

## Indiana

*Coal Car Supply*—The United Fourth Vein Coal Company, which has several coal mines on the Southern Indiana road, has asked the Circuit Court at Terre Haute to prevent the enforcement of the

order of the Indiana Railroad Commission for the distribution of cars at mines along that road. The coal company claims that it had entered into contracts to deliver coal based on the present method of allotting cars, and that the order of the commission would work a hardship. This action and the suit filed by the Southern railroad will likely be tried at the same time. The commission asserts that it has taken action in the name of the people and of the consumers and shippers to find out the facts. It is not the purpose, the commissioners say, to reduce rates except when found exorbitant and inequitable, but to prevent at all times unjust discrimination by railroads and to insure an equitable distribution of cars and fair treatment to all mines on the basis of their daily output.

*Miners' Wage Payments*—Notwithstanding repeated statements by the operators that they could not get cash to meet the semi-monthly pay rolls Nov. 16, all of them, with a possible exception of two, paid their employees entirely in cash. The excepted mine operators paid part in cash and part in checks, the latter to be cashed in a few days. The proposed payment by checks occasioned a strike in the block coalfield of Clay county. A mass meeting was held in Clinton, at which the miners voted unanimously against accepting checks and these demonstrations caused the operators to make strong efforts to raise the currency necessary to meet the pay rolls.

*Petersburg Coal Company*—Joseph Foley, of New Albany, has closed a deal for the purchase of the holdings in Indiana and Illinois of the Petersburg Coal Company. Foley is the representative of Edward F. Shepard, of New York, who is believed to be acting for the Chicago & Alton Railway Company. The sale includes the coal rights of about 80,000 acres of coal land, together with a number of working mines.

## Michigan

COPPER

*Calumet & Hecla*—Work on the new No. 18 shaft is progressing favorably The framework of the shaft house and foundations for engine, boiler and changing house are completed. The company has announced a reduction of 12½ per cent. from the regular scale of wages. It takes effect Dec. 1.

*Mohawk*—Three of the four heads at the stamp mill are in commission treating about 2000 tons of rock daily. The yield is a little more than 16 lb. per ton. No. 5 shaft, which is the newest of the openings, is opening up good copper rock.

*Lake*—The new three-compartment shaft on this property is down about 50 ft., and the showing in copper rock is favorable, considering the shallow depth. Considerable mass copper is being encountered; one piece, weighing approximately 1000 lb., was recently taken out.

*Adventure*—All work on this property is being centered in No. 3 shaft. A diamond drill is at work expecting to open on the same formation which was encountered on the Lake property.

## Missouri

JOPLIN DISTRICT

*Little Pearl Mining Company*—J. C. McDowell, of Pittsburg and T. C. Malloy, of Joplin have started their mill on their 15 lot lease on the Continental tract west of Joplin. Ore has been met with from 120 to 185 ft. and sheet ground from 190 to 225 ft. Two shafts are in commission.

*Hickory Grove Mining and Milling Company*—W. H. Titus and H. Perret, of Excelsior Springs, and H. Connelly and Charles Emmerich, of Joplin, have incorporated a company capitalized at $50,000. The property is a 10-acre lease on Silver creek, four miles south of Joplin.

*Sherwin-Williams*—The zinc oxide plant east of Joplin has laid off the men and closed down. The poor condition of the money market is supposed to be the cause.

*Yellow Dog*—W. B. Caulkins has shut down this mine at Webb City on account of the low price of ore.

*Rex Mining and Smelting Company*—Five prospecting drills are at work on the 1000-acre tract of this company.

*Old Dominion Mining Company*—A reduction of 25c. per day in the wages of day's pay men and 5 to 6c. per car for shovelers has been announced.

*New Strike*—Several rich drill strikes were made at Jackson station by Mattes Brothers and of the 180 ft. of necessary shaft, 30 ft. have been sunk. This territory is new, and no other producers are in the camp.

*Badger-Peacock Camp*—The Badger Mining and Milling Company and the S. H. & S. Company were compelled to offer pay in checks on account of money shortage. The men refused to accept checks and went out on a strike. The mines are now shut down.

## Montana

BUTTE DISTRICT

*Amalgamated*—The October production of the Amalgamated companies was little in excess of 7,000,000 lb. copper. The Amalgamated, North Butte, Coalition and Original combined produced only about 8,400,000 lb., as against a normal production of about 28,000,000 lb. per month.

*Butte & London*—Crosscutting has progressed 100 ft. north and south from the 1100-ft. station. To the south one stringer about 3 ft. wide has been cut. The material assays in copper, silver and gold. The ground is growing softer and the water is increasing.

*Butte Central*—Lessees are mining a lot of silver ore in the Ophir mine, some of which is being shipped and a lot stored. The company expects to resume sinking on its shaft within a few weeks. Manager Cameron has been in Boston for several weeks, in consultation with Eastern officials of the company.

*East Butte*—All dead work in this mine has been stopped. Big bodies of milling ore have been blocked out, and when work was stopped a vein of high-grade ore was being opened on the 900-ft. level. Lessees are working the upper levels and are taking out about 100 tons of ore per day.

*Parrot*—The main shaft has reached a depth of 2030 ft., and sinking has been stopped. Crosscutting north and south from the 1900 and 2000-ft. levels has started. The company is mining on the 1600, 1700 and 1800-ft. levels, but is taking out only about 150 tons per day. Before the curtailment it mined about 500 tons per day. The company is also mining a little on the 800- and 1000-ft. levels of the Little Mina.

## Nevada

DOUGLAS COUNTY—YERINGTON

*Mason Valley*—A number of men are employed in development work in this mine. The ledge is 60 ft. in width and in many parts averages over 10 per cent. copper. Large quantities of smelting ore are opened up for stoping.

*Wabuska*—Sinking and crosscutting operations are being actively carried out on the Wild Horse claim and 1000 ft. to the north another shaft is being sunk that has cut a vein of copper. A third shaft will be sunk on the property.

NYE COUNTY—BULLFROG

*Gold Bar*—The concrete foundations for the company's new mill have been completed and work on the buildings is being started. The machinery has all been delivered and the erection of portions of it will be commenced as soon as the buildings are well under way.

*Hayseed*—Rich ore is still being shipped and the pay streak in the vein continues to look well. The portions of the mine in which ore is now being raised will be extensively developed by the company. At a recent meeting of the directors at Bullfrog it was decided to let out other portions of the property to lessees. A large number of applications for leases have been made.

*Los Angeles*—A station is being cut at the 40-ft. level with the view of facilitating the sinking of an incline shaft on the vein from this point. The vein is broken up a good deal and the management wishes to keep on until it gets into more settled country.

NYE COUNTY—MANHATTAN

*La Lime*—The lessees on this property are still raising unusually rich shipping ore, and are planning to erect a new power hoist and to carry on operations on a larger scale.

*Extension*—General Manager Kirchen reports that shipments are now going forward from the 270, 400, 500 and 600—all the levels in the mine—and that the usual tonnage is going forward to the smelters. Work on the 1050 level is progressing satisfactorily and the formation is improving, the face now being in the true lode porphyry of the district.

*Hercules*—A large amount of development work is being done on the property, which is situated about six miles north of the town. A shaft is being sunk at a point where the surface indications were favorable, and as depth is attained the ledge formation is improving. Two small ledges were exposed near the surface by an open cut and the shaft was started between the ledges, and now, at a depth of 60 ft., the ledges appear to be coming together.

WHITE PINE COUNTY

The report in the newspapers last week to the effect that the Nevada Consolidated and Cumberland-Ely companies had suspended operation was incorrect. But little work has been done in the mines of the Nevada Consolidated for a long time, the orebodies having been developed to such an extent that it was unnecessary to prosecute further explorations for the present, and recent work has been confined chiefly to the sinking of a new shaft and making other necessary arrangements for extraction of the ore. The Cumberland-Ely company has been in a somewhat similar position, although the development of its orebody has not been so complete as in the Ruth and Eureka mines. The fact is that both of these companies are simply awaiting the completion of the Steptoe works. It is expected that the first part of the latter will be ready for operation soon after the end of the year.

*Cumberland*—A large amount of development work has lately been done in this old mine and the company will soon begin shipping gold ore to the five-stamp mill, which it purchased recently from Dr. H. A. Whitney.

*Gold Bar*—This placer property is yielding good returns and the company has been enabled to declare another dividend of 4c. per share.

*Lead King*—This company has shipped a carload of ore to the smelter and another shipment is being prepared. The ore runs 70 per cent. lead and was taken from a drift in the 50-ft. shaft sunk from the top of the hill. The tunnel that is being driven to tap the rich orebodies at depth has cut a number of high-grade stringers, 35 ft. from its entrance.

*Nevada Consolidated*—The annual report of this company as of June 30, specifies assets and liabilities as follows: Assets—Property account, $3,880,242; investment account, $3,050,000; capital stock (200,000 shares) trusteed for conversion of Nevada Northern Railway Company bonds of equal par value, $1,000,000; accounts collectable, $3250; cash and call loans, $710,943; total, $8,644,435. Liabilities—Capital stock, $6,500,000; premium on sales of capital stock, $961,503; par value of investment securities in excess of par value of Nevada Company's stock issued in exchange therefor, $1,000,000; accounts payable, $139,125; interest on bank deposits, $43,807; total, $8,644,435. President James Phillips, Jr., in his report to stockholders, calls attention to the estimate of Pope Yeatman, the company's engineer, which puts the ore blocked out ready for removal to the smelter when the plant is completed, at 14,432,962 tons. This ore is calculated to yield 40 lb. of copper and 15 cents in gold and silver per ton. It is expected that the smelting plant will be ready for operation in the first half of 1908.

## North Dakota

WILLIAMS COUNTY

*Briquetting Plant*—The first briquetting plant to develop the lignite coalfields of this State will soon be in operation at Williston. The system to be used is one devised by Mr. Stewart, manager of the American Briquetting Company.

## Pennsylvania

ANTHRACITE COAL

*Philadelphia & Reading Coal and Iron Company*—This company's report for September and the three months of the fiscal year from July 1 to Sept. 30 shows earnings as below:

| | Sept. | Three Mos. |
|---|---|---|
| Earnings | $2,928,892 | $8,768,541 |
| Expenses | 2,683,966 | 8,185,791 |
| Net earnings | $ 244,926 | $ 582,750 |

For the three months there were increases of $2,229,872 in earnings, and of $1,707,715 in expenses; leaving a gain of $522,157 in net earnings.

## South Dakota

CUSTER COUNTY

*Ivanhoe*—The company has purchased the Radanda claim, an old high-grade producer.

LAWRENCE COUNTY

*Gold Eagle*—Work is being pushed on the new treatment plant to get it in shape before severe weather and the mines are being put in condition for steady supply.

*Iron Creek Mining and Development Company*—After a four year interval, work has been resumed and an effort will be made to reach quartzite which it is believed can be obtained at 235 ft., 150 ft. below the present shaft pit.

*Bear Gulch and Gold Hill*—Reorganization is being effected to promote permanent work on the gold ledges. A small force of miners is cleaning up the property.

*Bear Gulch District*—An unusually open fall has permitted placer work to be continued with profit and miners and outfits are busy on all the adjacent streams and are figuring on working for at least another month.

*Cochran*—James Cochran has spent the past year in developing this ground near the Pennington county line. He has opened up three ledges one of high-grade ore, and is now figuring on building a mill.

## Texas

*Texas Lignite Association*—This association was organized at a meeting held recently in Rockdale. The following officers were elected: Col. D. A. Nunn, of Crockett, president; J. J. Olsen, of San Antonio, vice-president; Ira Perry, of Rockdale, secretary. The following membership was enrolled: Worley Coal Company, of Rockdale; International Coal and Brick Company, of Rockdale; Rockdale Lignite Company, of Rockdale; Black Diamond Coal Company, of Rockdale; Ryan, Hanson & Perry, of Rockdale; American Lignite Briquet and Coal Company, of San Antonio; Big Lump Coal Company, of San Antonio; Burnet Fuel Company, of Milano; Carr Wood and Coal Company, of San Antonio, Tex.; Houston County Coal and Coke Company, of Crockett.

The matters principally discussed at this meeting were the operators' inability to secure coal cars for loading. A committee was appointed to attend the convention of shippers to be held at Dallas.

BREWSTER COUNTY

*Chisos Mining Company*—While sinking the shaft to the 300-ft. level it is reported that this company went through a 13-ft. vein of quicksilver ore. Material for a treatment plant is now on the ground and will make the three-mile wagon haul of the ore unnecessary.

## Utah

SALT LAKE COUNTY

*Utah Copper Company*—The copper production of this company in October is said to have been 3,000,000 lb., of which 600,000 lb. came from the Copperton mill and 2,400,000 from the Garfield mill. The latter produced 4000 tons of concentrate which averaged 30 per cent. copper. Six sections of the mill were in operation. The seventh section has been put in operation since November 1.

BEAVER COUNTY

*Horn Silver*—This property has been

closed down indefinitely, after almost continuous operation of nearly a quarter of a century. Low copper prices are attributed as the cause.

*Majestic*—All of the properties of this company are closed and will probably remain in that condition until after the first of the coming year.

*Newhouse Mines and Smelters*—This company is employing about 45 men. The mill is being operated one shift a day, the ore coming mostly from places where development is in progress.

JUAB COUNTY

*Little Chief*—This property has been closed temporarily. It has an indebtedness of $14,000. Shareholders have been called on for an assessment.

*Mammoth*—This mine has been producing sensationally high-grade ore lately. Thirty tons marketed a few days ago gave returns of 100 oz. gold to the ton. A car load sold a few days previous averaged 14 oz. in gold.

*Grand Central*—This company is going to sink its shaft to 2500 ft. which will make it the deepest in the State. Its present depth is 2100 feet.

SUMMIT COUNTY

*Daly West*—This company has a small force of men doing some repairing in the mine, but no attempt has been made to resume actual mining since the Park City miners' union called a strike some time ago.

*Daly Judge*—This company is equipping its mine with an electric haulage system which will be ready for operation about December 15.

*Iowa Copper*—This company continues development work vigorously and makes an occasional shipment of ore.

## Wisconsin

ZINC AND LEAD

*D. C. C.*—This mine has contracted with the Galena Iron Works for a 50-ton jig-concentrating mill.

*Homestead*—This mine has resumed operations after a disastrous fire, and is opening up a 7-ft. breast of sheet ore, lead and jack, at the 116-ft. level.

*Lyght Lead and Zinc Company*—The plant of this company which was destroyed by fire some months ago, has resumed operations. Large boulders of lead and jack, weighing from 50 to 100 lb., are being taken out in loose ground at the 80-ft. level.

*Sullivan*—This company is prospecting by churn drill, and believes it has struck the Vandeventer run, almost within a stone's throw from the latter workings. The last two holes drilled bear evidence of heavy sheet jacks.

*Weigle*—This company is constructing a double jig concentrator which will be ready for operation by Dec. 1.

## Canada

BRITISH COLUMBIA—BOUNDARY DISTRICT

*Dominion Copper Company*—This company's several copper mines and its smelting works, all in the Boundary district, have been closed down. The president, Warner Miller, of New York, and another director are expected to arrive at Greenwood, shortly; they will probably announce the intentions of the management in regard to a resumption of operations.

BRITISH COLUMBIA—CASSIAR DISTRICT

*Berry Creek Mining Company*—The season's results on this company's placer gold property on Thibert creek, northeastern Cassiar, have proved disappointing, a big slide of overburden having filled flumes and blocked gravel pits, so that the value of gold recovered has only about half that of the 1906 season. Wm. Irving, superintendent, and his men have come out for the winter.

BRITISH COLUMBIA—QUEEN CHARLOTTE ISLANDS

Strikes of copper ore have been reported from several places on Moresby island of the Queen Charlotte group. The only property that has yet shipped ore to the smelter is one at Ikeda bay, owned by a Japanese company, which has shipped about 1000 tons of copper ore of good grade to the Tyee Copper Company's smelter on Vancouver island.

BRITISH COLUMBIA—VANCOUVER ISLAND

*Western Fuel Company*—This company's coal mines near Nanaimo are producing about 2400 tons of coal a day. Plans for extending the company's business connections and increasing production are being worked out.

NOVA SCOTIA

*Dominion Iron and Steel Company*—The directors have issued a supplementary report, showing the damages that they believe they should secure from the Dominion Coal Company on the basis of the recent judicial decision in their favor, and the net earnings for the first quarter of the fiscal year ending Aug. 31. The claim for damages up to that date amounts to $1,796,660. The gross earnings for the three months from June 1 to Aug. 31, on the basis of the contract price of coal, were $705,347; net earnings, $515,833. After providing for instalment of second mortgage bonds, there remains an available surplus of $453,333. The extra cost of coal above contract price for the three months, amounting to $333,412, is charged to the Dominion Coal Company.

ONTARIO—COBALT DISTRICT

*Ore Shipments*—Shipments of ore for the week ending Nov. 2 were as follows: Buffalo, 40,000 lb.; Foster, 66,000; La Rose, 249,870; McKinley-Darragh, 120,000; total 475,870 lb.

## Mexico

SONORA—CANANEA

With the exception of the Calumet & Sonora, the Elenita, and a little work by the Fay Cananea, the Cananea district is practically idle, the drastic shutdown at the Greene having scared out the few smaller companies. Hundreds of people are leaving on every train. The deposits of Mexicans in the Banco de Cananea, a company concern, have been drawn to a minimum. The regular force of Mexican soldiery has been increased. Stores, shops, markets, especially in the Ronquillo and Chivatera sections of the town, are closed, the hotels are almost empty, and ingoing trains are carrying little business.

*Elenita Development Company*—The group of claims lying alongside the Greene Copper Company's old property at Cananea, and denounced a year or so ago by Messrs. Talbot and Lindsay, has been formed into a company of which L. W. Powell, representative in the Southwest of the T. F. Cole interests, is president. The Calumet & Sonora, which is now developing rich silver-lead properties, adjoins the southeast end of the group.

## New Caledonia

Exports of minerals in August and the eight months ended Aug. 31 are reported by the *Bulletin du Commerce*, of Noumea, as follows, in metric tons:

| | August. | Eight Mos. |
|---|---|---|
| Nickel ore | 12,391 | 75,923 |
| Cobalt ore | 641 | 2,694 |
| Chrome ore | 6,380 | 21,466 |
| Iron ore | 2 | 32 |

The August exports of chrome ore, 6380 tons, were all to the United States.

At Carenage the Anna Madeline mine, owned by the Societé le Chrome de Prony is ready to ship. The mine has been opened, the necessary machinery is nearly all in place, and a tramway 12 km. long has been built from the mine to the shipping port on the bay of Carenage.

Chalas & Fils, of Noumea, representing Birch & Co., of Sydney, New South Wales, have taken an option for one year on a nickel property at Camboni.

## New Zealand

Gold exports from New Zealand for July and the seven months ended July 31 are reported by the Mines Department as follows, in ounces bullion:

| | 1906. | 1907. | Changes. |
|---|---|---|---|
| July | 62,807 | 52,966 | D. 9,841 |
| Seven months | 327,928 | 279,441 | D. 48,487 |

The bullion reported for the seven months this year was equal to 263,172 oz. fine gold, or $5,439,751. Exports of silver were, in ounces:

| | 1906. | 1907. | Changes. |
|---|---|---|---|
| July | 103,689 | 116,741 | I. 13,052 |
| Seven months | 729,776 | 893,445 | I. 163,669 |

The greater part of the silver comes from the mines of the Hauraki district.

# Metal, Mineral, Coal and Stock Markets

**Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks**

## QUOTATIONS FROM IMPORTANT CENTERS

### Coal Trade Review

*New York, Nov.* 13—Up to the present time the coal markets in the West have not been as much affected by the financial disturbances as might have been expected. Trade at the larger consuming centers is good and the mines are generally working well. No restriction in output is marked. Railroad service is about the same; perhaps fewer complaints are heard. There are, however, some signs of a halt in new developments for the time.

The bituminous trade in the East is steady. Demand for steam coal keeps up fairly well, although the money market disturbance is having more effect than in the West. Coastwise trade continues active.

The anthracite market is quiet. Demand for domestic sizes is about as usual at this time of year; but the call for steam sizes is not at all urgent.

#### Coal Traffic Notes

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to Nov. 2 were as follows, in short tons:

| | 1906. | 1907. | Changes. |
|---|---|---|---|
| Anthracite | 3,706,088 | 4,737,236 | I. 1,031,148 |
| Bituminous | 26,884,439 | 32,925,455 | I. 6,041,016 |
| Coke | 10,638,953 | 11,780,263 | I. 1,141,310 |
| Total | 41,229,480 | 49,442,954 | I. 8,213,474 |

The total increase this year was 19.9 per cent.

Shipments of anthracite coal by lake from Buffalo for the season to Nov. 1 were 2,157,783 tons in 1906, and 2,865,905 tons in 1907; an increase of 708,122 tons. The larger shipments this year were to Chicago, 1,038,385 tons; Milwaukee, 411,675; Duluth and Superior, 876,675; Fort William, Ontario, 135,100 tons.

Shipments of anthracite coal in October were 6,015,857 long tons, the largest ever reported in a single month. For the 10 months ended Oct. 31 the shipments, by companies, were as follows:

| | 1906. Tons. | Per Ct. | 1907. Tons | Per Ct. |
|---|---|---|---|---|
| Reading | 9,242,696 | 20.2 | 11,658,563 | 20.9 |
| Lehigh Valley | 8,318,541 | 18.2 | 9,648,455 | 17.3 |
| N. J. Central | 5,644,058 | 12.4 | 7,209,362 | 13.0 |
| Lackawanna | 7,576,442 | 16.6 | 8,625,262 | 15.5 |
| Del. & Hudson | 4,479,581 | 9.8 | 5,503,507 | 9.9 |
| Pennsylvania | 3,892,291 | 8.5 | 4,781,541 | 8.6 |
| Erie | 4,503,653 | 9.9 | 5,975,884 | 10.7 |
| N. Y., Ont. & W. | 2,023,152 | 4.4 | 2,258,893 | 4.1 |
| Total | 45,680,414 | 100.0 | 55,661,467 | 100.0 |

All the companies showed increases. The total gain this year was 9,981,053 tons, or 21.8 per cent.

Coal tonnage of the Chesapeake & Ohio railway for the three months of its fiscal year from July 1 to Sept. 30 is reported as follows, in short tons:

| | Coal. | Coke. | Total. |
|---|---|---|---|
| New River | 1,515,070 | 61,206 | 1,576,276 |
| Kanawha | 1,295,977 | 27,137 | 1,323,144 |
| Kentucky | 71,344 | ..... | 71,314 |
| Connecting lines | 74,423 | 29,906 | 104,329 |
| Total | 2,956,814 | 118,249 | 3,075,063 |
| Total, 1906 | 2,315,734 | 82,559 | 2,398,293 |

The total increase was 676,770 tons, or 29.2 per cent. Deliveries this year of tonnage originating on the line were: To points west of mines, 1,506,502 tons coal and 56,361 tons coke; to points east, 447,658 tons coal and 31,982 tons coke; to tidewater, 928,231 tons coal.

### New York

#### Anthracite

*Nov.* 13—The anthracite market is not especially active either in prepared or small steam sizes. Prices are quoted as follows: Broken, $4.75; egg, stove and chestnut, $5; pea, $3.25; buckwheat No. 1, $2.75; buckwheat No. 2 or rice, $2.15@2.25; barley, $1.75, all f.o.b. New York harbor.

#### Bituminous

Trade in New York harbor is active, the demand is strong, and there does not seem to be much coal to spare. Prices are strong, good grades of Pennsylvania steam coal bringing $2.90@3 and ordinary grades $2.80@2.85 f.o.b. New York harbor

The unsettled condition of trade in general is felt in the coal market, in spite of the fact that good volumes of coal are going forward and are being absorbed. Various reports of business contraction have been circulated, and the coal trade has been looking for relaxation in business; so far this has not been apparent.

In the far East the demand for coal still continues strong. The shoalwater ice-making ports are practically supplied now, although some are still asking for coal. However, vessels are afraid of contracting to these ports at this time. Trade along the Sound is absorbing much coal and consumers in this territory seem willing to pay prevailing prices for odd lots.

Transportation from mines to tide is a little slower this week than last, and car supply is variable. In some regions cars are more plentiful than in others.

In the coastwise-vessel market vessels are in fair supply. Freight rates are as follows: From Philadelphia to Boston, Salem and Portland, $1; to Newburyport and Lynn, $1.25; to the Sound, 85@90c. per ton..

### Birmingham

*Nov.* 11—Coal operations in Alabama are disturbed a little by reason of the dull iron market and the financial flurry. There appears to be quite an urgent demand for coal, however, and the mines are working steadily. No drop in prices for coal is announced; in fact all deliveries are being made on old contracts. Prominent coal operators in this district express no apprehension as to the future.

The coke production has been reduced considerably in this district, but this is believed to be only temporary.

### Chicago

*Nov.* 11—The local coal market continues unsettled by financial conditions, but current consumption is heavy and orders for the future are not yet largely affected by the lack of circulating money. There is a general tendency to hold off buying until the future is more certain.

Illinois and Indiana coals hold up to the prices of last week or slight variations therefrom, lump and egg being $2.15@2.75, run-of-mine, $1.75@2.25, and screenings $1.15@1.60.

Eastern coals are not strong, except gas coals, which are scarce. Smokeless is in large supply and sells for $4.30, lump and egg, and $3.10@3.35 run-of-mine. Youghiogheny at $3.25 for ¾-in. and Pittsburg No. 8 at $3 for 1¼-in. are firm.

The anthracite trade is reported fairly good, but large needs remain to be filled in the city trade.

### Cleveland

*Nov.* 12—Local coal dealers on Monday reported a strong condition of the soft-coal market. The following prices are quoted: No. 8 district, Ohio slack, 65@70c., sales of large tonnages being reported at the latter figure; mine-run, $1.10@1.20; ¾-in lump, $1.20@1.30; all mine prices. Middle district grades are quoted at the following prices f.o.b. Cleveland: Slack, $1.55; mine-run, $1.90. The scarcity of cars on the Wheeling & Lake Erie railroad has caused the establishment of a 5c. difference in price on that road over B. & O. consignments. There was a strong demand in the wholesale trade Monday, and in consequence dealers anticipate that the week-end will see higher prices.

### Indianapolis

*Nov.* 11—Notwithstanding the scarcity of money and the closing down of many industries there has been a large demand for coal at the Indiana mines. The coal-carrying railroads are doing an enormous business and would do more if cars were obtainable. The mines are working from three-fourths to full time and the output is only limited by the capacity of the railroads. The mild weather during the week had a conservative effect upon the retail trade, but dealers are making no complaint, since they need a little time and good weather to stock up and prepare for the rush of orders expected with the first cold spell.

With the opening of the Glenburn mine, near Linton, the United Fourth Vein Coal Company will have six of its seven mines in full operation. The opening of the mine is due to the improvement of car supply and the demand for coal. Nineteen of the 21 mines of the Vandalia company are working every day, while the Shirley Hill, Little Giant and Summit companies in the Linton district are doing fully as well.

### Pittsburg

*Nov.* 12—While the river coal mines are being operated to capacity, there being a large supply of empty craft in the pools, the railroad mines are not being run to more than 60 per cent. of capacity, owing to the shortage of cars. Nearly all the coal loaded in the pools and harbor was shipped during the week, there being an excellent stage of water. The harbor is now crowded with empties. Prices remain firm on the basis of $1.40@1.50 for mine-run coal at mine. Slack is quoted at 70@80c. Large Pittsburg concerns have many inquiries for coal, a number being for foreign shipment, which they have been forced to decline. The demand is still in excess of production.

*Connellsville Coke*—Demand continues to fall off owing to the closing of blast furnaces and prices are consequently lower. Standard Connellsville furnace coke is quoted at $2.50@2.60 for any delivery and foundry coke prices $3@3.15. The H. C. Frick Coke Company in addition to closing 1000 ovens recently, has put 14 works on five days running time a week. Production is being restricted throughout the region. The *Courier* in its weekly summary gives the production in both regions at 362,611 tons. The shipments for the week aggregated 13,544 cars, distributed as follows: To Pittsburg, 4774 cars; to points west of Connellsville, 7850 cars; to points east of Connellsville, 920 cars.

## Foreign Coal Trade

Coal tonnages of the leading British railways for the year 1906 are reported as follows: Northeastern, 36,749,917; Midland, 23,519,062; London & Northwestern, 20,217,186; Great Western, 18,122,718; North British, 18,063,717; Taff Vale, 15,097,209; Caledonian, 12,684,307; Great Central, 11,294,213; Lancashire & Yorkshire, 9,097,297; Great Northern, 5,388,734. Without exception, these roads showed increases over the preceding year.

Imports of coal and coke into the United States for the nine months ending Sept. 30, were, in long tons, as follows:

| | 1906. | 1907. | Changes. |
|---|---|---|---|
| Great Britain | 85,508 | 30,635 | D. 54,873 |
| Canada | 1,109,065 | 1,047,437 | D. 61,628 |
| Japan | 10,775 | 86,512 | I. 75,737 |
| Australia | 142,651 | 342,723 | I. 200,072 |
| Other countries | 4,445 | 6,981 | I. 2,536 |
| Total coal | 1,352,444 | 1,514,288 | I. 161,844 |
| Coke | 102,141 | 100,242 | D. 1,899 |
| Total | 1,454,585 | 1,614,530 | I. 159,945 |

The decrease in imports from Canada into California was made up by larger receipts of Australian and Japanese coal. Some Nova Scotia coal comes to New England ports, but the bulk of the imports of coal is on the Pacific coast. The coke is chiefly from British Columbia, though a little comes from Germany.

Shipments of coal from Nova Scotia mines for the nine months ended Sept. 30 were as follows, in long tons:

| | 1906. | 1907. | Changes. |
|---|---|---|---|
| Dominion Co. | 2,426,464 | 2,404,649 | D. 21,815 |
| N. S. Steel | 480,141 | 465,240 | D. 14,901 |
| Acadia | 192,968 | 230,243 | I. 37,275 |
| Intercolonial | 209,946 | 202,574 | D. 7,372 |
| Inverness | 140,070 | 176,572 | I. 36,502 |
| Total | 3,449,589 | 3,479,278 | I. 29,689 |

The total increase this year was 0.9 per cent.

## Iron Trade Review

*New York, Nov.* 13—The condition of the iron and steel trades remains unchanged from last week. There is practically no new business coming forward, and on all sides we hear of works closing, or reducing their production.

In pig iron there are no sales, except of small emergency lots. Nominally there has been little change in prices, but reductions could probably be secured with little difficulty on transactions of any considerable size. A number of furnaces have gone out of blast, and others are preparing to follow.

In finished material there are also no new orders for the present, though some makers look forward hopefully for work, especially in plates and structural steel. Specifications on contracts come slowly, though no considerable cancellations are reported. No change can be expected until the money situation clears itself.

The steel-rail question is still unsettled, and very few railroads are placing orders. The situation is further complicated by the financial position, and the prospect for rail orders is very uncertain.

### Baltimore

*Nov.* 12—Imports for the week included 28 tons of spiegeleisen and 450 tons of ferromanganese. Receipts of iron pyrites were 4000 tons from Spain; of manganese ore, 460 tons from Rotterdam. Arrivals of iron ore were 10,650 tons from Cuba, and 11,530 tons from Nicolaieff, Russia; 22,180 tons in all.

### Birmingham

*Nov.* 11—The curtailment of production of pig iron and steel in this district is still on. The railroad car shortage is being felt in some parts of this district. There is no inquiry being received for future deliveries. All repair work has been cut off and every possible expense is being saved.

The topic of discussion in this district is the purchase of the Tennessee Coal, Iron and Railroad Company by the United States Steel Corporation. Engineers and other officials of the Steel Corporation are in the Birmingham district looking over the properties.

Pig iron prices are not publicly stated any more, though it is understood that no great concessions are being made to secure business. No. 2, foundry, has been quoted recently at $17 for delivery the last of this year and the first half of next year.

### Chicago

*Nov.* 11—The pig-iron market continues quiet, with no signs of a break in the prices of such iron as is being daily bought for quick delivery, in small lots. This is the only business, practically, now being done in this district. Local melters are running along with as great needs as ever. Their future business is not doubtful, given exemption from anything like a panic. And panic conditions were nearer to all appearances two weeks ago than they are now.

The standard quotations are as last week: $22.50 for Northern No. 2 and $18 Birmingham ($22.35 Chicago) for Southern No. 2, with business done on various prices, some orders being placed at 50c., others perhaps at $1 under these figures. All the current business is in small lots, from a carload to 500 tons.

Coke is still at $5.90 for the best Connellsville, with the demand not large and the supply adequate, though not too great.

### Philadelphia

*Nov.* 13—So far as our local pig-iron business is concerned there is very little to report. The only difference between now and a week ago is that the large restriction in capacity being made and contemplated may react favorably upon demand and prices. Consumers of pig iron throughout this territory have been vis-

ited and urged to place orders and enter into contracts, but the result of the canvass up to today has not been encouraging. Neither foundry men nor mill men show a disposition to buy, and instead of the lower prices constituting an inducement they are having the contrary effect. Our larger consumers in this city, or a few of them when asked to state frankly their views, said that now is a good time to wait and watch developments. Probably some business could be closed at once if the furnace men would accept a shading of 50c., but two or three of the larger interests stated today they would rather suspend production than do business on that basis. No actual change has been made in pig-iron quotations for a week.

*Steel Billets*—Steel billets have been selling in a small way, but none of the consumers in this territory will order in large lots.

*Merchant Bar*—Notwithstanding the disturbed condition in so many directions, local bar-iron interests are able to report satisfactory activity and no curtailment to speak of. The inquiries that are in hand relate mostly to common iron. The retail demand for steel bars is better than for refined iron.

*Sheets*—Our sheet people do not admit that there has been any material falling off in business. The large manufacturers are inclined to shade current quotations on large orders.

*Merchant Steel*—The few retailers of merchant steel report the sending off of a good many orders to the mills this week for material to be hurried forward.

*Pipes and Tubes*—The consumption of pipes and tubes is probably as heavy now as it has been at any time. Tubes are not as strong, probably because the mills have caught up, but the fluctuation in prices is unimportant.

*Plates*—Steel plates are strong is small lots. Boiler plate is more active just now than any other kind, though the market has felt the stimulus of inquiry this week from car-building sources.

*Steel Rails*—The efforts recently made to secure business outside of the country are resulting in orders in Pennsylvania rail mills. Business is being done with Manchuria, Cuba, Mexico and South America.

*Scrap*—It is impossible to make an encouraging report in the old material market. About the only business that has been done is in heavy scrap, railroad and wrought-iron scrap. Prices are weak and business is light.

### Pittsburg

*Nov.* 12—Conditions in the iron and steel markets continue dull, but while the outlook is not as bright as a week ago, it is not regarded as discouraging. The situation is in strong hands and when the financial disturbance is over it is believed that the iron and steel trade will be restored to normal conditions. In order to prevent a serious slump in prices production is being curtailed. Pig-iron production is restricted and efforts are being made to dispose of all the available supply.

That prices have been easier during the past two months was developed today, when the bi-monthly adjustments were made under the wage agreement with the Amalgamated Association of Iron, Steel and Tin Workers. The returns of bar iron sales of the Republic Iron and Steel Company showed that the average of common iron bars for September and October was around 1.60c. The last settlement showed 1.65c. This reduces the pay of the puddlers from $6.62½ a ton to $6.50 a ton and the finishers suffer a reduction of 1 per cent. The tin-plate average was unchanged at $3.70 a box, or 30c. above the base of the scale. In sheets there was a reduction. The average was less than 2.50c. in the sales of Nos. 26, 27 and 28 gages and the wages of sheet workers which ruled at 5.2 per cent. above the base of 2.30c. will be 2.6 per cent. lower, but still 2.6 per cent. above the base. The returns made by the American Sheet and Tin Plate Company indicate that the leading interest has been shading prices on sheets during the past two months.

It is reported that a number of steel bar orders have been canceled and specifications have fallen off considerably. Prices, however, remain firm. Iron bars continue to decline and are quoted $2 a ton below steel bars. No new business of any consequence has been booked for any of the finished lines for over a week.

*Pig Iron*—More blast furnaces have been closed since the last report and others are operating on greatly reduced output. Prices have declined fully $1 a ton in all grades. Bessemer pig iron is quoted at $20, Valley furnaces, but it is believed a lower price could be done. Foundry iron also has weakened and No. 2 is quoted at $19. Basic is down to $18 and gray forge to $18.50, all f.o.b. Valley furnaces. There have been no transactions except in small lots.

*Steel*—The agreement entered into by large billet makers has had the effect of strengthening prices. Production has been curtailed and bessemer billets are quoted at $28, open-hearth at $29 and sheet-bars at $31. It is understood, however, that sheet-bars may be shaded. Plates remain at 1.70c. and merchant steel bars at 1.60c.

*Sheets*—Additional sheet plants have been closed and there is no demand for black sheets. The regular price of 2.60c. for No. 28 gage is being shaded by $2 and more. Galvanized sheets are strong at 3.75c. for No. 28 gage.

*Ferro-Manganese*—Prices remain about the same, although it is reported that $53 a ton might be shaded.

## Metal Market

NEW YORK, Nov. 13.

### Gold and Silver Exports and Imports

At all United States Ports in Sept. and year.

| Metal. | Exports. | Imports. | Excess. |
|---|---|---|---|
| Gold: | | | |
| Sept. 1907.. | $ 1,503,836 | $ 2,734,086 | Imp. $ 1,230,250 |
| " 1906.. | 1,178,922 | 31,431,038 | " 29,152,116 |
| Year 1907.. | 49,879,813 | 30,837,287 | Exp. 19,042,526 |
| " 1906.. | 35,789,962 | 111,776,017 | Imp. 75,986,055 |
| Silver: | | | |
| Sept. 1907.. | 6,048,457 | 3,789,113 | Exp. 2,259,344 |
| " 1906.. | 3,594,311 | 3,262,559 | " 331,752 |
| Year 1907.. | 47,970,793 | 34,454,571 | " 13,516,222 |
| " 1906.. | 45,441,339 | 32,994,069 | " 12,447,270 |

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

### Gold and Silver Movement, New York

For week ending Nov. 12 and years from Jan. 1

| Period. | Gold. | | Silver. | |
|---|---|---|---|---|
| | Exports. | Imports. | Exports. | Imports. |
| Week..... | $ ..... | $7,272,752 | $ 897,830 | $ 70,447 |
| 1907..... | 34,818,544 | 16,057,878 | 45,155,012 | 2,633,088 |
| 1906..... | 6,039,183 | 92,662,366 | 45,473,330 | 1,903,504 |
| 1905..... | 34,509.503 | 10,482,569 | 30.021.374 | 3.861.519 |

There were no exports of gold for the week; the silver went chiefly to London. Imports of gold for the week were chiefly from Great Britain and Germany; of silver from the West Indies.

The Treasury Department estimate of the money in the United States on Nov. 1 is as follows:

| | In Treasury. | In Circul'n. |
|---|---|---|
| Gold coin (inc. bullion in Treasury)..... | $ 166,645,890 | $ 574,459,086 |
| Gold certificates..... | 71,341,960 | 677,295,909 |
| Silver dollars..... | 2 287,023 | 88,822 959 |
| Silver certificates ..... | 7 177.432 | 464,349,568 |
| Subsidiary silver..... | 6,661,373 | 127,461,229 |
| Treasury notes of 1890... | 11,074 | 5,601,926 |
| U. S. notes..... | 3,426,863 | 343,254,153 |
| Nat. Bank notes..... | 14,856,600 | 595.123,866 |
| Total..... | $272,408 215 | $2,876,368 696 |

Population of the United States, Nov. 1, 1907, estimated at 86,547,000; circulation per capita, $33.23. For redemption of outstanding certificates an exact equivalent in amount of the appropriate kinds of money is held in the treasury, and is not included in the account of money held as assets of the Government. This statement of money held in the treasury as assets of the Government does not include deposits of public money in national-bank depositories to the credit of the treasurer of the United States, amounting to $207,786,733. The total amount in circulation Nov. 1 shows an increase of $70,514,322 over Oct. 1; and an increase of $9,485,910 over Nov. 1 of last year.

The movement of gold and silver in Great Britain for the nine months ended Sept. 30 was as follows:

| Gold: | Imports. | Exports. | Excess. |
|---|---|---|---|
| 1907..... | £33,752,192 | £24,989,296 | Imp. £8,762,896 |
| 1906..... | 33,115,117 | 28,352,304 | " 4,762,813 |
| Silver: | | | |
| 1907..... | 12,603,097 | 13,199,952 | Exp. 596,855 |
| 1906..... | 14,412,499 | 15,157,178 | " 744,679 |

Of the silver imports this year a total of £9,057,643 was credited to the United States.

## Silver Market

SILVER AND STERLING EXCHANGE.

| Nov. | Sterling Exchange. | Silver. New York, Cents. | Silver. London, Pence. | Nov. | Sterling Exchange. | Silver. New York, Cents. | Silver. London, Pence. |
|---|---|---|---|---|---|---|---|
| 7 | 4.8525 | 59⅜ | 27 3/16 | 11 | 4.8550 | 58⅛ | 26 7/8 |
| 8 | 4.8535 | 58½ | 27 3/16 | 12 | 4.8575 | 58¾ | 27 3/16 |
| 9 | 4.8550 | 58⅛ | 26 15/16 | 13 | 4.8560 | 58½ | 27 1/8 |

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

The director of the mint this week bought 200,000 oz. silver, 100,000 for delivery at Denver and 100,000 at New Orleans. The price paid was 59.269c. per fine ounce.

Shipments of silver from London to the East as reported by Messrs. Pixley & Abell as follows, for the year to Oct. 31:

| | 1906. | 1907. | Changes. |
|---|---|---|---|
| India | £ 13,372,896 | £9,899,954 | D. £ 3,472,942 |
| China | 430,700 | 99,850 | D. 330,850 |
| Straits | 1,750 | 625,950 | I. 624,200 |
| Total | £ 13,805,346 | £10,625,754 | D. £ 3,179,592 |

Imports for the week were £198,000 from New York. Exports were £58,000 to India, £6000 in bars and £25,450 in Mexican dollars to Hong Kong; £81,450 in all.

Indian exchange has weakened slightly, and the Council bills offered in London were taken at an average of 15.97d. per rupee. Buying of silver for India has been light.

## Prices of Foreign Coins

| | Bid. | Asked. |
|---|---|---|
| Mexican dollars | $0.47¾ | $0.49 |
| Peruvian soles and Chilean | 0.41 | 0.46 |
| Victoria sovereigns | 4.83 | 4.86 |
| Twenty francs | 3.87 | 3.92 |
| Spanish 25 pesetas | 4.78 | 4.80 |

## Other Metals

| Nov. | Copper. Lake, Cts. per lb. | Copper. Electrolytic, Cts. per lb. | Copper. London, £ per ton. | Tin. Cts. per lb. | Lead. Cts. per lb. | Spelter. New York, Cts. per lb. | Spelter. St. Louis, Cts. per lb. |
|---|---|---|---|---|---|---|---|
| 7 | 14½ @14¾ | 13¾ @14 | 60¼ | 29¾ | 4.45 @4 50 | 5 05 @5 15 | 4 90 @5.00 |
| 8 | 14¼ @14½ | 13½ @13¾ | 59¼ | 30¼ | 4.45 @4 50 | 5.05 @5.10 | 4.90 @4.95 |
| 9 | 14¼ @14½ | 13¾ @13¾ | ..... | 30¾ | 4.45 @4.50 | 5.05 | 4.90 |
| 11 | 14 @14¼ | 13¾ @13¾ | 61 | 31¼ | 4.40 @4.50 | 5.00 @5.05 | 4 85 @4.90 |
| 12 | 13¾ @14¼ | 13¼ @13½ | 60¼ | 31⅛ | 4.40 @4.50 | 4.95 @5.05 | 4.80 @4.90 |
| 13 | 13½ @14 | 13¼ @13½ | 58¾ | 30¾ | 4.40 @4 50 | 4.95 @5.05 | 4.80 @4.90 |

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electroytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary western brands; special brands command a premium.

*Copper*—The buying movement, the cessation of which was noted last week has not been renewed, and business, both for domestic orders and for export has been on rather a small scale. With this cessation of business, there has been competition for such orders as appeared.

On the whole, the market throughout the week has been very quiet. The purchases which consumers made during the recent rally have taken care of their immediate requirements, and with business and financial conditions as they are, nothing but hand-to-mouth purchases can be expected. On the other hand, there is quite a little pressure to sell copper, particularly on the part of speculators who bought on the recent rise, in the hope of finding a market at a still higher level. From this source concessions have been made from day to day, and this is not surprising in view of the difficulty of financing. The market closes easy at 13½@14c. for Lake copper; 13¼@13½c. for electrolytic in ingots, cakes and wirebars. Business in casting copper has been done during the week at an average of 13@13¼ cents.

The London standard market is beginning to show a rather tired appearance. Speculative accounts seem to be fairly well adjusted on the whole, and the price of standard copper is keeping more and more within its natural ratio to the refined sorts. In sympathy with the latter, there has been a decline during the week, and the close is cabled at £58 15s. for both spot and three months.

Refined and manufactured sorts we quote: English tough, £57; best selected, £64; strong sheets, £69.

The Quincy Mining Company last week sold 500,000 lb. copper to the Navy Department at 14½c., deliveries December and January. The department will soon purchase 1,000,000 lb. more.

The Calumet & Hecla employees have voted to accept the reduction of 12½ per cent. in wages ordered by the company. There will be no strike of the miners in the Lake copper country.

Exports of copper from New York and Philadelphia for the week were 7034 long tons. Our special correspondent gives the exports from Baltimore for the week at 346 tons.

Imports and exports of copper in Germany for the nine months ended Sept. 30 were: Imports, 93,867 metric tons; exports, 6387; balance, imports, 87,480 tons, a decrease of 3869 tons from last year. Of the imports this year, 73,616 tons were from the United States.

*Copper Sheets and Wire*—The base price for copper sheets is 20c. per lb.; of wire, 16½@16¾c. per pound.

*Tin*—The London market throughout the week has shown considerable strength, and closes somewhat easier at £138 10s. for spot, £139 15s. for three months.

Business in the domestic market was limited to retail lots and for prompt delivery only. The latter commands a premium over import prices as the stocks are concentrated among a few firms. The market closes quiet at about 30¾c. per pound.

*Lead*—The stocks which have been accumulating for some time past are pressing on the market, and holders have been lowering their prices from day to day without, however, inducing purchases on the part of consumers. This has brought about a deadlock, the upshot of which cannot as yet be foreseen. The market closes weak at 4.40@4.50c. New York, while there are sellers at St. Louis at 4.30@4.35c.

As noted in our editorial columns, the daily quotations for lead given in our table are—beginning Nov. 7—those of the open market; that is, we give the prices made on wholesale transactions in New York from day to day by sellers. The price quoted by the American Smelting and Refining Company on contracts has continued through the week at 4.75c. New York.

The London lead market is somewhat lower and the close is cabled as £17 10s. for Spanish lead, £17 12s. 6d. for English lead.

*Spelter*—Under free offerings from all sources, prices have declined further without, however, stimulating more interest on the part of consumers. The close is quoted at 4.95@5.05c. New York, 4.80@4.90c. St. Louis.

London also cables a further decline, the close being £21 10s. for good ordinaries, £21 15s. for specials.

The National Zinc Company last week started up two blocks of its new smelter at Bartlesville, Indian Territory.

*Silesian Spelter Market*—Under date of Oct. 28 Paul Speier writes from Breslau that there were a few more purchases to meet immediate needs of consumers and that the market is firm. Spelter holds at 43.50@44.50 marks per 100 kg. (4.698@4.806c. per lb.). Freights from Upper Silesia to London have been reduced from 30 to 20 marks per metric ton. The export of zinc sheets in September included large quantities sent to Argentina. The price is 52@55.50 marks per 100 kg. (5.616@5.994c. per lb.) according to the size of orders. Zinc dust was quiet, prices being 41.75@42 marks per 100 kg. (4.509@4.536c. per lb.) f.o.b. Stettin, casks included. Exports and imports in Germany for the nine months ended Sept. 30 were, in metric tons:

| | Imports. 1906. | Imports. 1907. | Exports. 1906. | Exports. 1907. |
|---|---|---|---|---|
| Spelter | 27,532 | 22,665 | 46,109 | 45,882 |
| Zinc sheets | 58 | 86 | 11,758 | 15,129 |
| Zinc scrap | 1,677 | 778 | 3,634 | 5,377 |
| Zinc ore | 134,795 | 131,091 | 32,699 | 25,529 |
| Zinc dust | ..... | 727 | ..... | 1,629 |
| Zinc oxide | ..... | 4,762 | ..... | 13,892 |
| Lithophone | 1,149 | 1,579 | 5,901 | 6,885 |

Average prices for spelter, f.o.b. works in Silesia have been this year. First quarter, 5.519c. per lb.; second, 5.261c.; third, 4.611c. In 1906 the averages were 5.497c., 5.573c. and 5.648c., respectively.

*Zinc Sheets*—The base price is $7.50 per 100 lb.—less discount of 8 per cent.—f.o.b. cars at Lasalle and Peru. The freight rate to New York is 27.50c. per 100 lb.

*Antimony*—The market is entirely without life both in New York and abroad. Quotations are as follows: Cookson's, 11c.; Hallett's, 10c; ordinary brands, 8¾@9⅛c.

*Nickel*—For large lots, New York, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities, 50@65c., same delivery.

*Quicksilver*—New York quotations are $45 per flask for lots of 100 flasks or over, and $46 for smaller orders. Retail sales are made at 62@63c. per lb. The London price is £8 5s. per flask, with £8 3s. 9d. quoted from second hands.

*Platinum*—The market continues rather dull. Scrap has again receded in price and dealers are making no concessions in the purchase of old metal. Prices are: Hard metal, $29; ordinary, $26@26.50; scrap, $18.50@19 per troy ounce.

## Missouri Ore Market

*Joplin, Mo., Nov.* 9—The highest price reported paid for zinc was $42.50 per ton, on an assay base ranging from $35 to $40 per ton of 60 per cent. zinc. The average price, all grades, was $35.46, large shipments of silicate adding to a general reduction in price. The highest price paid for lead was $51, prices ranging down to $40 and averaging $43.42 per ton.

While the zinc market weakened very materially during the week, there was a stronger tendency at the close, with heavy sampling for next week's purchases. Lead offerings at the end of the week were higher and bidding stronger than during the early or middle portion, and the market closed firm. The buying of both ores took the widest range of the year, and there was an apparent lack of confidence on the part of both buyers and sellers.

Following are the shipments of zinc and lead from the various camps of the district for the week ending Nov. 9:

| | Zinc, lb. | Lead, lb. | Value. |
|---|---|---|---|
| Webb City-Carterville | 1,938,180 | 739,460 | $ 52,124 |
| Joplin | 2,159,650 | 203,270 | 45,302 |
| Galena | 1,268,300 | 59,940 | 23,888 |
| Duenweg | 590,750 | 116,220 | 13,484 |
| Alba-Neck City | 620,380 | 3,990 | 12,486 |
| Prosperity | 327,380 | 59,070 | 7,355 |
| Badger | 345 880 | ..... | 6,744 |
| Aurora | 419,480 | 9,060 | 5,624 |
| Granby | 575,000 | 10,000 | 5,500 |
| Carl Junction | 164,970 | 8,200 | 3,308 |
| Zincite | 135,730 | 6,210 | 2,567 |
| Spurgeon | 95,120 | 39,760 | 1,746 |
| Baxter Springs | 63,300 | 15,590 | 1,655 |
| Sarcoxie | 80,480 | ..... | 1,488 |
| Cave Springs | 77 250 | ..... | 1,381 |
| Carthage | 60.220 | ..... | 1,204 |
| Totals | 8,922,070 | 1,270,770 | $185,856 |
| 45 weeks | 513,055,740 | 76,611,490 | $14,284,930 |

Zinc value, the week, $158,263; 45 weeks, $11,537,857
Lead value, the week, 27,590; 45 weeks, $2,747,073

Average prices for ore in the district, by months, are shown in the following table:

| ZINC ORE AT JOPLIN. | | | LEAD ORE AT JOPLIN. | | |
|---|---|---|---|---|---|
| Month. | 1906. | 1907. | Month. | 1906. | 1907. |
| January | 47.38 | 45.84 | January | 75.20 | 83.53 |
| February | 47.37 | 47.11 | February | 72.83 | 84.58 |
| March | 42.68 | 48.66 | March | 73.73 | 82.75 |
| April | 44.63 | 48.24 | April | 75.13 | 79.76 |
| May | 40.51 | 45.98 | May | 78.40 | 79.56 |
| June | 43.83 | 44.82 | June | 80.96 | 73.66 |
| July | 43.25 | 45.79 | July | 74.31 | 68.18 |
| August | 43.56 | 43.22 | August | 75.36 | 59.54 |
| September | 42.58 | 40.11 | September | 79.64 | 53.52 |
| October | 41.55 | 39.83 | October | 79.84 | 51.40 |
| November | 44.13 | ..... | November | 81.98 | ..... |
| December | 43.68 | ..... | December | 81.89 | ..... |
| Year | 43.24 | ..... | Year | 77.40 | ..... |

## Wisconsin Ore Market

*Platteville, Wis., Nov.* 9—Early in the week 60 per cent. zinc ore sold at $40, but declined later to $39 per ton; buyers are restricted again to light purchases. Very little lead ore sold during the week, the market price declining from $23 to $22 per thousand for 80 per cent. lead.

Shipments for the week ended Nov. 9 were:

| Camps. | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Highland | 593,800 | ..... | ..... |
| Hazel Green | 582,350 | ..... | ..... |
| Platteville | 317,930 | ..... | ..... |
| Cuba City | 242,000 | ..... | ..... |
| Benton | 220,420 | 85,470 | ..... |
| Galena | 192,400 | 45,900 | ..... |
| Linden | 190,000 | ..... | 36,660 |
| Livingston | 180,000 | ..... | ..... |
| Dodgeville | 125,000 | ..... | ..... |
| Elmo | 55,010 | ..... | ..... |
| Rewey | 54,000 | ..... | ..... |
| Mineral Point | 20 000 | ..... | ..... |
| Harker | ..... | ..... | ..... |
| Total for week | 2,773,810 | 131,640 | 36,660 |
| Year to Nov. 9 | 89,755,827 | 4,422,030 | 462,360 |

Dubuque, Iowa, shipped 101,040 lb. zinc ore and Shullsburg, Wis., 132,000 lb. in October, not heretofore reported.

## Chemicals

*New York, Nov.* 13—The general market for chemicals is dull and few future orders are being booked. Prices, in most cases, are holding firm. Tin products are off, in sympathy with the drop in the price of the metal and white arsenic is inclined to be weak.

*Copper Sulphate*—Buyers are still loath to place large orders while the metal market remains unsettled. Prices remain at $5.50 per 100 lb. for carloads and $5.75 for smaller lots.

*Nitrate of Soda*—There is little business, but prices remain firm. Quotations are as follows: For spot delivery and also for the balance of 1907, 2.37½@2.40c. for 95 per cent.; for 1908, 2.42½c.; for 1909, 2.40c. The price for the 96 per cent. grade, these deliveries, is 5c. per 100 lb. higher.

Messrs. Mortimer & Wisner, of New York, report the position of nitrate of soda in the United States on Nov. 1 as follows, in long tons:

| | 1906. | 1907. | Changes. |
|---|---|---|---|
| Stocks, Jan. 1 | 13,100 | 13,050 | D. 50 |
| Imports, 10 mos. | 240,780 | 266,845 | I. 26,065 |
| Total supplies | 253,880 | 279,895 | I. 26,015 |
| Deliveries, 10 mos. | 242,680 | 269,095 | I. 26,415 |
| Stocks, Nov. 1 | 11,200 | 10,800 | D. 400 |
| Afloat for U. S. ports | 80,000 | 65,000 | D. 15,000 |

The quantities afloat include all cargoes due to arrive at United States ports up to Jan. 15 next. Imports are all from the West Coast of South America.

*Phosphate Rock*—Prices are stable on account of the depleted supply. Inquiries are frequent. The following quotations are more or less nominal: Florida high-grade rock, $10.25@15.50 f.o.b. shipping point; land pebble, $8.25@8.50; Tennessee, domestic, $4@6.75; South Carolina, hot-air dried, $7@7.25 f.o.b. Ashley river.

J. M. Lang & Co. report shipments of Florida phosphates through the port of Savannah in September at 7259 long tons, all to Germany.

## Mining Stocks

*New York, Nov.* 13—The stock market is still dependent upon money conditions, and trading has been on a moderate scale. The fluctuations in prices have had little meaning, quotations rising one day and falling the next with little apparent reason. The closing is depressed, following a slight recovery earlier in the week. Amalgamated Copper sold at $46¾; American Smelting common, $62; United States Steel, $24½ for the common and $84½ for the preferred.

The curb market has showed trading in small volume with narrow price movements. The coppers were not in favor and most of them lost fractionally on small sales.

### Boston

*Nov.* 12—Copper shares have receded in values the past week. This is not surprising in view of the fact that stocks have had substantial rallies from the low prices. Again many copper-mining companies will be obliged to reduce dividends and directors' meeting for this purpose will be held this month. Of the six companies to declare dividends, but two have already reduced their rates, namely Calumet & Hecla and Quincy, but others are expected to reduce or possibly pass their dividends. Parrot did pass its dividend today but this had been thoroughly discounted. Calumet & Arizona, Copper Range and North Butte may possibly cut their rates in half. Butte Coalition, it would seem, would pass its dividend, also with the closing of the properties.

Marketwise, Amalgamated has dropped $5.50 from the high to $46.50. It is generally believed that inside interests are

corralling the stock under $50. The reported strike at the Calumet & Hecla mine had little effect on the price of the stock, which is off but $10 net to $600. Calumet & Arizona advanced $6 to $110, but lost it again. Copper Range stiffened over $1 to $55.25, but is back to $53.50. This company has about 5700 stockholders at the present time, an increase of 1510 in a month's time, or since the sharp break.

Utah Consolidated made a sharp advance of $3 to $36.50, but broke to $32. Boston Consolidated needs new financing and will issue £250,000 of new 7 per cent. debenture bonds, convertible into stock at £3 per share, it being an English corporation.

## STOCK QUOTATIONS

| NEW YORK Nov. 12 | Clg |
|---|---|
| Alaska Mine | .... |
| Am.Nev.M.&P.Co. | .... |
| Amalgamated | 46¾ |
| Anaconda | 31¾ |
| Balaklala | .... |
| British Col. Cop. | 4½ |
| Buffalo Cobalt | 1½ |
| Butte & London | ¾ |
| Butte Coalition | 14 |
| Butte Cop. & Zinc | .... |
| Cobalt Contact | .... |
| Colonial Silver | 1 |
| Cum. Ely Mining | 5⅜ |
| Davis Daly | 4⅛ |
| Dominion Cop | 1⅞ |
| El Rayo | 2⅛ |
| Foster Cobalt | .68 |
| Furnace Creek | ¼ |
| Giroux Mine | 3½ |
| Gold Hill | ⅞ |
| Granby, New | .... |
| Greene Gold | ⅞ |
| Greene G. & S | ⅝ |
| Greenw'r & D.Val. | .75 |
| Guanajuato | 2¼ |
| Guggen. Exp. | 125 |
| Hanapah | .35 |
| McKinley Dar. | ¾ |
| Micmac | 3 |
| Mines Co. of Am. | 1⅜ |
| Mitchell Mining | ½ |
| Mont.Sho.C.(New) | 5 |
| Nev. Utah M. & S. | 2⅞ |
| Newhouse M. & S. | 7 |
| Nipissing Mines | 6 |
| Old Hundred | .... |
| Silver Queen | ¾ |
| Stewart | ⅜ |
| Tennessee Cop'r. | 24 |
| Union Copper | ⅞ |
| Utah Apex | 2⅜ |
| West Columbus | .11 |

| N. Y. INDUSTRIAL | |
|---|---|
| Am. Agri. Chem. | .... |
| Am. Smelt. & Ref. | 62 |
| Am. Sm. & Ref., pf. | 87 |
| Bethlehem Steel | .... |
| Colo. Fuel & Iron | 17 |
| Federal M.& S., pf. | 54⅞ |
| Inter. Salt | 11 |
| National Lead | 36¼ |
| National Lead, pf. | 83 |
| Pittsburg Coal | .... |
| Republic I. & S | 16 |
| Republic I.& S.,pf. | 59 |
| Sloss-Sheffield | 38¼ |
| Standard Oil | 402 |
| Tenn. C. & I. | .... |
| U. S. Red. & Ref. | .... |
| U. S. Steel | 24⅝ |
| U. S. Steel, pf | 84⅜ |
| Va. Car. Chem | 16¼ |
| Va. I. Coal & Coke | .... |

| ST. LOUIS Nov. 9 | | |
|---|---|---|
| N. of Com. | High. | Low. |
| Adams | .30 | .25 |
| Am. Nettie | .04 | .03 |
| Center Cr'k | 2.00 | 1.75 |
| Cent. C. & C. | 66.00 | 64.00 |
| C.C. & C. pd. | 75.00 | 74.00 |
| Cent. Oil | 105.00 | 100.00 |
| Columbia | 3.00 | 2.00 |
| Con. Coal | 27.00 | 23.00 |
| Doe Run | 130.00 | 120.00 |
| Gra. Bimet. | .25 | .20 |
| St. Joe | 14.00 | 13.00 |

| BOSTON Nov. 12 | Clg. |
|---|---|
| Name of Comp. | |
| Adventure | 1 |
| Allouez | 23 |
| Am. Zinc | 20½ |
| Arcadian | 3⅜ |
| Atlantic | 9 |
| Bingham | 6¼ |
| Boston Con. | 10½ |
| Calumet & Ariz. | 104 |
| Calumet & Hecla | 600 |
| Centennial | 20 |
| Con. Mercur | .... |
| Copper Range | 53¾ |
| Daly-West | 11 |
| Franklin | 7½ |
| Greene—Can | 5¾ |
| Isle Royal | 15 |
| La Salle | 9¾ |
| Mass. | 2½ |
| Michigan | .... |
| Mohawk | 47 |
| Mont.C.&C.(new) | 1½ |
| Nevada | 7⅞ |
| North Butte | 39 |
| Old Colony | .50 |
| Old Dominion | 23¼ |
| Osceola | 80 |
| Parrot | 9 |
| Phoenix | .... |
| Quincy | 80 |
| Rhode Island | 2½ |
| Santa Fe | 2 |
| Shannon | 10 |
| Tamarack | 60 |
| Trinity | 12 |
| United Cop., com. | .... |
| U. S. Oil | 8¾ |
| U. S. Smg. & Ref. | 32 |
| U.S.Sm.& Re.,pd. | 36½ |
| Utah Copper | 33 |
| Victoria | 4½ |
| Washington | .... |
| Winona | .... |
| Wolverine | 112 |
| Wyandotte | .20 |

*Ex. Div. †Ex. Rights.

| BOSTON CURB | |
|---|---|
| Ahmeek | 50 |
| Ariz. Com | .... |
| Black Mt. | 4½ |
| East Butte | .... |
| Hancock Con. | .... |
| Keweenaw | .... |
| Majestic | .70 |
| Raven | .77 |
| Shawmut | .51 |
| Superior | 9⅜ |
| Superior & Pitts | 9¼ |
| Troy Man | .61 |

| LONDON Nov. 6 | | | |
|---|---|---|---|
| Name of Com. | Clg. | | |
| Dolores | £0 | 20s | 0d |
| Stratton'sInd. | 0 | 3 | 0 |
| Camp Bird | 0 | 16 | 9 |
| Esperanza | 1 | 12 | 6 |
| Tomboy | 1 | 6 | 3 |
| El Oro | 1 | 1 | 3 |
| Oroville | 0 | 14 | 0 |
| Somera | .. | .. | . |
| Utah Apex | 0 | 11 | 5 |
| Ariz.Cop.,pfd. | .. | .. | . |
| Ariz.Cop.,def. | .. | .. | . |

Cabled through Hayden, Stone & Co., N. Y.

### NEVADA STOCKS. Nov. 13.

Furnished by Weir Bros. & Co., New York.

| Name of Comp. | Clg. | Name of Comp. | Clg. |
|---|---|---|---|
| TONOPAH STOCKS | | Golden Sceptre | ... |
| Belmont | 1.00 | Homestake King. | .50 |
| Extension | 1.00 | Montgomery Mt. | .04 |
| Golden Anchor | .05 | Mont. Shoshone C. | 4.75 |
| Jim Butler | .47 | Original Bullfrog. | .03 |
| MacNamara | .18 | Tramp Cons | .20 |
| Midway | .45 | MANHAT'N STOCKS | |
| Montana | 1.38 | Manhattan Cons. | .30 |
| North Star | .09 | Manhat'n Dexter. | .10 |
| Tonopah & Cal. | ... | Jumping Jack | .10 |
| Tono'h Mine of N. | 8.75 | Stray Dog | .11 |
| West End Con | .35 | Indian Camp | .06 |
| GOLDFI'D STOCKS | | GREENW'R STOCKS | |
| Adams | .05 | Furnace Creek | .25 |
| Atlanta | .21½ | Greenwater &D.V. | .06 |
| Blue Bell | .08 | Green'rCop.M.& S. | .05 |
| Blue Bull | .17 | United Greenwa'r | .04 |
| Booth | .20 | MISCELLANEOUS | |
| Columbia Mt | .19 | Golden Boulder | .20 |
| Comb. Frac | .90 | Hayseed | .30 |
| Cracker Jack | .07 | Lee Gold Grotto | .14 |
| Dia'dfield B. B. C. | .17 | Nevada Hills | 3 75 |
| Goldfield Belmont | .16 | Nevada Smelting. | 1.00 |
| Goldfield Con. | 4.06½ | Pittsburgh S. Pk. | .97 |
| Goldfield Daisy | .90 | Round Mt. Sphinx | .32 |
| Goldfield Mining | ... | | |
| Great Bend | .30 | | |
| Jumbo Extension | .70 | | |
| Jumbo Mining | ... | | |
| Katherine | .06 | | |
| Kendall | .12 | | |
| Laguna | ... | | |
| Lone Star | .09 | | |
| Lou Dillon | .06 | | |
| May Queen | .07 | | |
| Mohawk | ... | | |
| Oro | .09 | | |
| Red Hill | .24 | | |
| Red Top | ... | | |
| Roanoke | .09 | | |
| Sandstorm | .18 | | |
| Silver Pick | .24 | | |
| St. Ives | .42 | | |
| Triangle | .08 | | |
| BULLFROG STOCKS | | | |
| Amethyst | ... | | |
| Bullfrog Daisy | ... | | |
| Bullfrog Mining | .04 | | |
| Bullfrog Nat. B | .09 | | |
| Gibraltar | .16 | | |
| Gold Bar | .39 | | |

| COLO. SPRINGS Nov. 9 | |
|---|---|
| Name of Comp. | Clg. |
| Acacia | .... |
| Black Bell | .... |
| C. C. Con | 3 |
| Dante | 4¾ |
| Doctor Jack Pot | 5¾ |
| Elkton | 47 |
| El Paso | 30 |
| Findlay | 40 |
| Gold Dollar | 6 |
| Gold Sovereign | 3¾ |
| Isabella | 21 |
| Index | .... |
| Jennie Sample | .... |
| Jerry Johnson | .... |
| Mary McKinney | .... |
| Pharmacist | .... |
| Portland | 94 |
| Un. Gold Mines | .... |
| Vindicator | 80 |
| Work | 14 |

### New Dividends

| Company. | Payable. | Rate. | Amt. |
|---|---|---|---|
| Am. Smelters A | Dec. 2 | $1.50 | $255,000 |
| Am. Smelters B | Dec. 2 | 1.25 | 375,000 |
| Am. Zinc, Lead & Smg | Nov. 1 | 0.50 | 40,000 |
| Batopilas | Dec. 31 | 0.12½ | 56,250 |
| Bunker Hill & Sullivan | Nov. 4 | 0.60 | 120,000 |
| Camp Bird | Nov. 2 | 0.24 | 196,800 |
| Doe Run | Nov. 15 | 0.50 | 29,531 |
| Goldfield Con | Nov. 15 | 0.10 | 500,000 |
| Kendall | Nov. 23 | 0.02 | 10,000 |
| Lehigh C. & Nav | Nov. 27 | 2.00 | 693,802 |
| Mexican Lead, pfd | Nov. 1 | 3.50 | 43,750 |
| Newhouse | Nov. 20 | 0.50 | 300,000 |
| New River Coal, pfd | Nov. 1 | 1.50 | 56,426 |
| Penn. Steel, pfd | Nov. 1 | 3.50 | 588,749 |
| Rio Tinto, com | Nov. 1 | 0.60 | 375,000 |
| Rio Tinto, pfd | Nov. 1 | 51.40 | 4,275,000 |
| Tezuitlan | Nov. 12 | 2.00 | 20,000 |
| U. S. C. I. Pipe & Fdy., com | Dec. 2 | 1.00 | 125,000 |
| U. S. C. I. Pipe & Fdy., pfd | Dec. 2 | 1.75 | 218,750 |
| U. S. Smg., Ref. & Mg., com. | Nov. 1 | 0.87½ | 304,646 |
| U. S. Smg., Ref. & Mg., pfd. | Nov. 1 | 0.87½ | 656,250 |
| U. S. Steel Corp., com | Dec. 30 | 0.50 | 2,451,513 |
| U. S. Steel Corp., pfd | Nov. 30 | 1.75 | 6,305,497 |
| Warwick I. & S | Nov. 15 | 0 30 | 43,674 |

### Assessments

| Company. | Delinq. | Sale. | Amt. |
|---|---|---|---|
| Best & Belcher, Nev. | Nov. 18 | Dec. 10 | $0.10 |
| Bonanza Con., Utah | Oct. 26 | Nov. 12 | 0.01 |
| Con. Imperial, Nev. | Nov. 7 | Nov. 27 | 0.01 |
| Del Monte, Cal. | Nov. 20 | Dec. 11 | 10.00 |
| Emerald, Utah. | Dec. 14 | Jan. 11 | 0.01 |
| Exchequer, Nev. | Oct. 28 | Nov. 19 | 0.05 |
| Helios, Cal. | Sept. 17 | Nov. 15 | 0.03 |
| Imlay | Nov. 23 | Dec. 17 | 0.01 |
| Julia | Nov. 5 | Nov. 27 | 0.03 |
| Little Chief, Utah | Oct. 30 | Nov. 30 | 0.01 |
| Mexican, Nev. | Oct. 15 | Nov. 5 | 0.10 |
| Mt. Dell, Utah | Nov. 19 | Dec. 7 | 0.01 |
| New Red Wing, Utah | Oct. 15 | Nov. 5 | 0.10 |
| Penn. Con., Cal. | Nov. 16 | Dec. 3 | 0.10 |
| ProvidentOilMg.,Ca. | Dec. 7 | Dec. 27 | 0.01½ |
| Seg.Belc. & Midas, C. | Nov. 6 | Nov. 27 | 0.05 |
| Scorpion, Nev. | Nov. 4 | Nov. 25 | 0.02 |
| Sleeping Beauty,Cal. | Oct. 12 | Nov. 15 | 0.05 |
| Stansbury, Utah | Nov. 18 | Dec. 16 | 0.01 |
| Union Con. | Nov. 15 | Dec. 6 | 0.10 |
| Wolverine & Ariz., A. | Nov. 18 | | 0.25 |

## Monthly Average Prices of Metals

### AVERAGE PRICE OF SILVER

| Month. | New York. | | London. | |
|---|---|---|---|---|
| | 1906. | 1907. | 1906. | 1907. |
| January | 65.288 | 68.673 | 30.113 | 31.769 |
| February | 66.108 | 68.835 | 30.464 | 31.852 |
| March | 64.597 | 67.519 | 29.854 | 31.325 |
| April | 64.765 | 65.462 | 29.984 | 30.253 |
| May | 66.976 | 65.981 | 30.968 | 30.471 |
| June | 65.394 | 67.090 | 30.185 | 30.893 |
| July | 65.105 | 68.144 | 30.113 | 31.366 |
| August | 65.949 | 68.745 | 30.529 | 31.637 |
| September | 67.927 | 67.792 | 31.483 | 31.313 |
| October | 69.523 | 62.435 | 32.148 | 28.863 |
| November | 70.813 | ..... | 32.671 | ..... |
| December | 69.050 | ..... | 32.003 | ..... |
| Year | 66.791 | ..... | 30.868 | ..... |

New York, cents per fine ounce; London, pence per standard ounce.

### AVERAGE PRICES OF COPPER

| | NEW YORK. | | | | LONDON. | |
|---|---|---|---|---|---|---|
| | Electrolytic | | Lake. | | | |
| | 1906. | 1907. | 1906. | 1907. | 1906. | 1907. |
| January | 18.310 | 24.404 | 18.419 | 24.825 | 78.869 | 106 739 |
| February | 17.869 | 24.869 | 18.116 | 25.236 | 78.147 | 107.356 |
| March | 18.361 | 25.065 | 18.641 | 25.560 | 81.111 | 106.594 |
| April | 18.375 | 24.224 | 18.688 | 25.260 | 84.793 | 98.625 |
| May | 18.475 | 24.048 | 18.724 | 25.072 | 84.867 | 102.375 |
| June | 18.442 | 22.665 | 18.719 | 24.140 | 83.994 | 97.272 |
| July | 18.190 | 21.130 | 18.585 | 21.923 | 81.167 | 95.016 |
| August | 18.380 | 18.356 | 18.706 | 19.255 | 83.864 | 79.679 |
| September | 19.033 | 15.565 | 19.328 | 16 047 | 87.831 | 68.375 |
| October | 21.203 | 13.169 | 21.722 | 13.551 | 97.269 | 60.717 |
| November | 21.833 | ..... | 22.398 | ..... | 100.270 | ..... |
| December | 22.885 | ..... | 23.350 | ..... | 105.226 | ..... |
| Year | 19.278 | ..... | 19.616 | ..... | 87.282 | ..... |

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

### AVERAGE PRICE OF TIN AT NEW YORK

| Month. | 1906. | 1907. | Month. | 1906. | 1907. |
|---|---|---|---|---|---|
| January | 36.390 | 41.548 | July | 37.275 | 41.091 |
| February | 36.403 | 42.102 | August | 40.606 | 37.667 |
| March | 36.662 | 41.313 | September | 40.516 | 36.689 |
| April | 38.900 | 40.938 | October | 42.852 | 32.620 |
| May | 43.313 | 43.149 | November | 42.906 | ..... |
| June | 39.260 | 42.120 | December | 42.750 | ..... |
| | | | Av. year | 39.819 | ..... |

Prices are in cents per pound.

### AVERAGE PRICE OF LEAD

| Month. | New York. | | London. | |
|---|---|---|---|---|
| | 1906. | 1907. | 1906. | 1907. |
| January | 5.600 | 6.000 | 16.850 | 19.828 |
| February | 5.464 | 6.000 | 16.031 | 19.531 |
| March | 5.350 | 6.000 | 15.922 | 19.703 |
| April | 5.404 | 6.000 | 15.959 | 19.975 |
| May | 5.685 | 6.000 | 16.725 | 19.688 |
| June | 5.750 | 5.760 | 16.813 | 20.188 |
| July | 5.750 | 5.288 | 16.525 | 20.350 |
| August | 5.750 | 5.250 | 17.109 | 19 063 |
| September | 5.750 | 4.813 | 18.266 | 19.775 |
| October | 5.750 | 4.750 | 19.350 | 18.531 |
| November | 5.750 | ..... | 19.281 | ..... |
| December | 5.900 | ..... | 19.609 | ..... |
| Year | 5.657 | ..... | 17.370 | ..... |

New York, cents per pound. London, pounds sterling per long ton.

### AVERAGE PRICE OF SPELTER

| MONTH. | New York. | | St. Louis. | | London. | |
|---|---|---|---|---|---|---|
| | 1906. | 1907. | 1906. | 1907. | 1906. | 1907. |
| January | 6.487 | 6.732 | 6.337 | 6.582 | 28.225 | 27.125 |
| February | 6.075 | 6.814 | 5.924 | 6.664 | 25.844 | 25.938 |
| March | 6.209 | 6.837 | 6.056 | 6.687 | 24.563 | 26.094 |
| April | 6.078 | 6.685 | 5.931 | 6.535 | 25.781 | 25 900 |
| May | 5.997 | 6.441 | 5.846 | 6.291 | 27.000 | 25.563 |
| June | 6.096 | 6.419 | 5.948 | 6.269 | 27.728 | 24.469 |
| July | 6.006 | 6.072 | 5.856 | 5 922 | 26.800 | 23.850 |
| August | 6.027 | 5 701 | 5.878 | 5.551 | 26.938 | 21.969 |
| September | 6.216 | 5.236 | 6.056 | 5.086 | 27.563 | 21.050 |
| October | 6.222 | 5.430 | 6.070 | 5.280 | 28.075 | 21.781 |
| November | 6.375 | ..... | 6.225 | ..... | 27.781 | ..... |
| December | 6.593 | ..... | 6.443 | ..... | 27.938 | ..... |
| Year | 6.198 | ..... | 6.048 | ..... | 27.020 | ..... |

New York and St .Louis, cents per pound. London in pounds sterling per long ton.